OCTOBER 1989

ACADEMIC MEDICINE

JOURNAL OF THE ASSOCIATION OF AMERICAN MEDICAL COLLEGES

Vietnam War Effect on Medical School Applicants

Improving Student Career Counseling

Research Training in Medical Informatics

Specialty Choices of U.S. Students:

- Contact with AIDS Patients as a Factor
- Effect of Racial-Ethnic Background
- Early and Final Preferences for Pediatrics
- "Controllable Lifestyle" as a Factor
- Schools' Characteristics and Family Medicine
- Choices of Honors Graduates
- Trends and Factors at One School

National Policy Perspectives

VOLUME 64 • NUMBER TEN

OCTOBER 1989
VOLUME 64
NUMBER TEN

ACADEMIC MEDICINE

JOURNAL OF THE
ASSOCIATION OF
AMERICAN MEDICAL
COLLEGES

Invited Article	The Effect of the Vietnam War on Numbers of Medical School Applicants *by Allen Singer, Ph.D.*	567
Innovations in Medical Education	Effective Use of Medical School Alumni to Improve Career Counseling for Students *by Martha Regan-Smith, M.D., John Eisold, M.D., Suzanne Boulter, M.D., and Philip Stebbins, M.D.*	574
Medical Informatics	Research Training in Medical Informatics: The Stanford Experience *by Edward H. Shortliffe, M.D., Ph.D., and Lawrence M. Fagan, M.D., Ph.D.*	575
From the President		579
National Policy Perspectives		580
AAMC Focus		582
Commentaries	Specialty Choice *by August G. Swanson, M.D.*	583
	Swingshift Encephalopathy *by Mark Wagner, Ph.D.*	584
Editorial		585
Letters to the Editor	Medical-Nutrition Education *by Roland L. Weinsier, M.D., Dr.P.H., C. Michael Brooks, Ed.D.; and by August G. Swanson, M.D.*	586
	Health Professions Research *by Charles R. B. Beckmann, M.D., M.H.P.E.*	587
Research Reports **ARTICLES**	Likelihood of Contact with AIDS Patients as a Factor in Medical Students' Residency Selections *by Roberta Ness, M.D., M.P.H., Charles D. Killian, M.A., David E. Ness, M.D., Judith B. Frost, M.A., and Don McMahon, M.A.*	588

Racial-Ethnic Background and Specialty Choice: A Study of U.S. Medical School Graduates in 1987 *by David Babbott, M.D., Dewitt C. Baldwin, Jr., M.D., Charles D. Killian, M.A., and Sheila O'Leary Weaver, M.S.* 595

Early and Final Preferences for Pediatrics as a Specialty: A Study of U.S. Medical School Graduates in 1983 *by Susan E. Coffin, M.D., and David Babbott, M.D.* 600

Controllable Lifestyle: A New Factor in Career Choice by Medical Students *by Richard W. Schwartz, M.D., Roy K. Jarecky, Ed.D., William E. Strodel, M.D., John V. Haley, Ph.D., Byron Young, M.D., and Ward O. Griffen, Jr., M.D., Ph.D.* 606

Characteristics of Medical Schools Related to the Choice of Family Medicine as a Specialty *by Doug Campos-Outcalt, M.D., and Janet H. Senf, Ph.D.* 610

Initial Career Choices of Medical School Honors Graduates in the Early 1970s and 1980s *by William E. Golden, M.D.* 616

Specialty Choices at One Medical School: Recent Trends and Analysis of Predictive Factors *by Tracy A. Lieu, M.D., Steven A. Schroeder, M.D., and David F. Altman, M.D.* 622

AAMC Data Report

Present Activities of 1989 U.S. Medical Graduates *by August G. Swanson, M.D., Richard R. Randlett, Robert A. Haynes, Ph.D., and Charles D. Killian* 630

Bibliography 634

Errata 633

PUBLISHING SERVICES: Hanley & Belfus, Inc.
210 South 13th Street, Philadelphia, PA 19107

OCTOBER 1989
VOLUME 64
NUMBER TEN

ACADEMIC MEDICINE

JOURNAL OF THE
ASSOCIATION OF
AMERICAN MEDICAL
COLLEGES

EDITOR: Addeane S. Caelleigh

DEPUTY EDITOR: Albert Bradford

SUBMISSIONS EDITOR: Christopher Greene

EDITORIAL ASSISTANT: Lisa R. Dittrich

PUBLISHER'S EDITOR: Sandra A. Lovegrove

ASSOCIATE EDITORS
Innovations in Medical Education
Wayne K. Davis, Ph.D.
University of Michigan Medical School

International Medical Education
David S. Greer, M.D.
Brown University Program in Medicine

Informatics
Daniel R. Masys, M.D.
Lister Hill National Center for Biomedical Communications

Book Reviews
Sherman M. Mellinkoff, M.D.
University of California, Los Angeles School of Medicine

CONSULTING EDITORS
L. Thompson Bowles, M.D., Ph.D.
George Washington University School of Medicine and Health Sciences
Milton Corn, M.D.
Georgetown University School of Medicine
Robert M. Heyssel, M.D.
The Johns Hopkins Health System
Donald G. Kassebaum, M.D.
Association of American Medical Colleges
Russell Miller, M.D.
Howard University
Jay P. Sanford, M.D.
Uniformed Services University of the Health Sciences
F. Edward Hébert School of Medicine
Martha Vaughan, M.D.
National Institutes of Health

OFFICERS OF THE ASSOCIATION
Chairman
D. Kay Clawson, M.D.
University of Kansas Medical Center School of Medicine

Chairman-Elect
David H. Cohen, Ph.D.
Northwestern University

Immediate Past Chairman
John W. Colloton, M.A.
University of Iowa Hospitals and Clinics

President
Robert G. Petersdorf, M.D.

Chairman, Council of Deans
L. Thompson Bowles, M.D., Ph.D.
George Washington University School of Medicine and Health Sciences

Chairman, Council of Academic Societies
Ernst R. Jaffé, M.D.
Albert Einstein College of Medicine

Chairman, Council of Teaching Hospitals
Gary Gambuti
St. Luke's-Roosevelt Hospital Center

EDITORIAL BOARD

L. Thompson Bowles, M.D., Ph.D. (Chairman)
George Washington University School of Medicine and Health Sciences
Philip C. Anderson, M.D.
University of Missouri, Columbia School of Medicine
G. William Bates, M.D.
Medical University of South Carolina College of Medicine
Nancy E. Gary, M.D.
Albany Medical College
David S. Greer, M.D.
Brown University Program in Medicine
Paul F. Griner, M.D.
Strong Memorial Hospital
Rochester, New York
Kaaren I. Hoffman, Ph.D.
University of Southern California School of Medicine
John E. Ives
St. Luke's Episcopal Hospital
Houston, Texas
Fernando S. Mendoza, M.D.
Stanford University School of Medicine
Gordon S. Page, Ed.D
University of British Columbia Faculty of Medicine
Hugh M. Scott, M.D.
Bishop's University
Lennoxville, Quebec
Charles E. Spooner, Jr., Ph.D.
University of California, San Diego School of Medicine
Manuel Tzagournis, M.D.
Ohio State University College of Medicine

Academic Medicine (ISSN 1040-2446) is owned and published monthly by the Association of American Medical Colleges, One Dupont Circle, N.W., Washington, DC 20036. Publishing services by Hanley & Belfus, Inc., 210 South 13th Street, Philadelphia, Pennsylvania 19107. Second-class postage paid at Washington, DC and additional mailing offices.

Copyright 1989 by the Association of American Medical Colleges. All material subject to this copyright may be photocopied for the noncommercial purpose of scientific or educational advancement. Printed in the U.S.A.

Subscription rates: U.S., Canada, Latin America—$60.00 per year and $7.00 per single copy ($30.00 per year for students); all other locations—$70.00 per year and $8.00 per single copy.

All advertising material published in this journal is intended to conform to ethical standards, but acceptance does not imply endorsement. The views expressed in all articles and features in this journal are those of the authors and do not necessarily reflect the position of the AAMC.

CORRESPONDENCE
Manuscripts: The Editor, *Academic Medicine*, Association of American Medical Colleges, One Dupont Circle, NW, Washington, DC 20036.

Advertising: Diane Sherel, Advertising Manager, Hanley & Belfus, Inc., 210 South 13th Street, Philadelphia, PA 19107; (215) 546-0313.
Subscriptions and changes of address: Membership and Publication Orders, AAMC, One Dupont Circle, NW, Washington, DC 20036.
Cancellations of an *Academic Medicine* subscription must be submitted in writing to Publication Orders, AAMC, One Dupont Circle, NW, Washington, DC 20036. Claims for back issues will be honored for only the three months before the cancellation.
Reprints: Request reprints directly from the authors of articles, not from *Academic Medicine*.
POSTMASTER: Send address changes to *Academic Medicine*, AAMC, Suite 200, One Dupont Circle, NW, Washington, DC 20036.

INVITED ARTICLE

ALLEN SINGER, Ph.D.

The Effect of the Vietnam War on Numbers of Medical School Applicants

Abstract—Among the little-noticed but far-reaching side effects of the Vietnam War was its impact on the higher education system. This often-unpopular war, coupled with the military draft and student deferment policies, led many young men to enter educational institutions of all types. Beginning around 1964, there was a surge of enrollments and degrees granted in higher education that began to abate only after the draft ended in 1973. The leading edge of the post-World War II "baby-boom" also became of college age in the mid-1960s and undoubtedly contributed to elevated levels of enrollments and degrees in higher education. But the Vietnam War had an impact over and above the purely demographic, as can be seen when population effects are factored out. This effect largely explains why the numbers of bachelor's degrees and doctorates (Ph.D. degrees and equivalent) granted to men suddenly stopped increasing in 1974 even though the relevant population groups continued to grow throughout the 1970s. The patterns of enrollments and degrees attained by women are quite different from the men's patterns, and they serve to reinforce the evidence of a draft effect. Students in health professions schools of all types were given special consideration under the deferment policies established by the Selective Service System, leading to rapid increases in applications to medical, dental, and other health professions schools during the period 1968–1974. Since then, the health professions schools have had quite similar experiences with applications—those from men have generally declined while those from women have generally increased. Also, career choices are shifting. Men are favoring degrees in business, engineering, and computer sciences over the main fields leading to medical schools—biology and chemistry. Women now outnumber men in number of bachelor's degrees granted annually, and the number of those degrees in the science fields is holding steady. *Acad. Med.* 64(1989):567–573.

Among the main concerns of the medical community today are the declining number of medical school applicants since 1974 and the implications of this trend for the long-term quality of medical education. This concern has prompted an examination of the causes of the rapid increase in medical school applicants starting around 1968 and the equally rapid and prolonged decrease from the 1974 peak.

It is tempting to attribute much of the increase to population growth because the post-World War II "baby-boom" generation began to pass through college in the 1960s. But population growth does not explain the sudden cessation in 1974 of growth in male college enrollments and degrees attained, because the college-aged population segments continued to increase until the 1980s. Instead, the evidence suggests strongly that student deferment policies established during the Vietnam War era led to a huge bulge at all levels of the higher education system. The historical data compiled for this analysis demonstrate the following points:

1. Much of the decline in applicants to medical school since 1974 has been a return to normality after an era of exceptionally strong growth in applicants that began around 1968 as a result of deferment policies that permitted undergraduate and graduate students to avoid or delay the military draft.

2. The effects of the Vietnam-War-era draft and deferment policies on applicants should have worked its way through the system and ended around 1978. The fact that the decline has continued through 1988 may be attributable to a combination of factors, including: (a) a radical shift away from the main fields leading to medical schools—biology and chemistry—in favor of engineering, computer sciences, and business, especially among men students; (b) sharp increases in medical school tuition beginning around 1976; and (c) the increasingly heavy debt burden incurred by college students during their undergraduate years.

3. The decline in medical school applicants is not an isolated phenomenon. Dental, veterinary, osteopathic, and other professional schools have had similar experiences traceable to an enrollment bulge in the educational system that started with increases in freshman enrollments around 1964 and led to more bachelor's and doctoral (Ph.D. and equiva-

Dr. Singer is senior research associate, Section for Operational Studies, Association of American Medical Colleges, Washington, D.C.

Correspondence and requests for reprints should be addressed to Dr. Singer, Section for Operational Studies, Association of American Medical Colleges, One Dupont Circle, N.W., Suite 200, Washington, D.C. 20036.

lent) degrees and more professional school applicants during the late 1960s and early 1970s. Student deferments encouraged high school graduates to enroll in college and permitted those already in undergraduate and graduate studies to complete their degree programs. Further, students in health professions schools were given special consideration under Selective Service policies.

The evidence for these assertions is presented in the following review and analysis of demographic and educational data covering the period from the mid-1950s to the mid-1980s and their relationship to the military draft and student deferment policies that prevailed during the Vietnam War. The figures accompanying this paper show the historical data on enrollments, degrees, applicants, and populations in corresponding age groups.

Method

Time series analyses provide the basic evidence leading to these findings.

Demographic and Educational Data

Before 1960 much of the necessary data does not exist in consistent form, and even to get data as far back as 1955 in some cases requires making assumptions and estimates. Nevertheless, the effects of the Vietnam War era draft on the educational system are so pronounced that they overcome any deficiencies in the data.

There are many possible explanations of the patterns exhibited by the data other than the draft—one of the major ones being demographic effects. Certainly the post-World War II "baby-boom" affected undergraduate and graduate school attendance in the 1960s and 1970s. But the data show that the draft and deferment policies created an effect that extended well beyond the purely demographic one.

In order to include the demographic factor in the analysis, ratios of each variable to the appropriate population group were calculated and are shown in the figures. For example, the number of first-time college enrollments has been related to the total population aged 18; bachelor's degrees have been related to the population aged 20 to 24; and professional school applicants have been related to the population aged 20 to 29.

In the figures, growth curves of the form $Y = e^{a-b/t}$ (shown as broken lines) have been fitted to the data in order to help estimate the magnitude of the Vietnam War effect. The curves are rough approximations of the patterns that would have occurred in the absence of the draft. In deriving the curves, the years in which the draft effect was most apparent were excluded. The assumption here is that the data would have followed a constrained growth pattern except for the distortions caused by the Vietnam War. This procedure is admittedly subjective, and the estimated growth curves should be interpreted as projections based on limited data sets.

Male-Female Comparisons

It is rare in studies of this kind to have adequate comparisons groups, but fortunately for this analysis a natural comparison group does exist. Since only men were subject to the draft, the patterns exhibited by women over this period should be different, and indeed they are. But women also seemed to react to the draft to a certain extent. Their patterns of enrollments and degrees during the draft era mirrored those of men, but to a lesser degree. One possible explanation is that women were induced for social and perhaps economic reasons to follow their men friends to college.

After the draft era ended, however, the men's and women's patterns departed radically from each other, with women's participation in undergraduate studies generally continuing to increase while that of men began to decline. By 1982 the number of bachelor's degrees granted to women exceeded the number granted to men, apparently for the first time in U.S. history.

Findings and Discussion

The findings show clearly the effect of the Vietnam War military draft on higher education enrollments and degree patterns.

Draft and Deferment Policies

A basic hypothesis of this paper is that the military draft and deferment policies in effect during the Vietnam War era created an enrollment bulge at all levels of the higher education system, starting in the mid-1960s and lasting for about ten years. The decline in applications to medical and other health professions schools during the late 1970s was largely due to the elimination of the draft in 1973, the end of the Vietnam War, and the subsequent return to a more normal pattern of college attendance on the part of young men. (The continued decline in applicants in the 1980s has a more complicated explanation, see page 572.)

The Selective Service System has undergone changes in its deferment policies many times since World War II as the needs of the military waxed or waned in response to international threats or conflicts. During the Korean War, draft calls accelerated from zero in 1950 to over 550,000 in 1951.[1] At that time, high school students were automatically deferred until graduation or age 20, and college students were deferred on the basis of the Selective Service College Qualification Test (SSCQT), class standing, or other evidence of satisfactory academic progress. The Korean War must have had an effect on the educational system similar to that of the Vietnam War, but an examination of that earlier period is beyond the scope of this paper.

After the Korean conflict ended, the draft remained in effect but at much reduced levels. Then, as the Vietnam conflict heated up in the 1960s, the Defense Department began to call for more inductions, and the number of educational deferments rose to new heights, remaining there until the draft was replaced by the all-volunteer army in 1973 (Figure 1).

Deferments for students were established in the Selective Service System under a concept called "channeling" whereby men in certain occupations deemed vital to the nation were granted exemptions from the draft. In 1951, categories I-S and II-S were established for deferred high school and college students, respectively. Liberal deferment policies for students were generally in effect until the Vietnam War escalated in the mid-1960s. In 1962, the SSCQT was dropped as a requirement for student deferments; students needed only to show evidence of satisfactory academic progress to retain their deferred status. A surplus of men eligible for the draft existed through 1964.

Then in 1965, the monthly draft requirements doubled because additional troops were needed in Vietnam. Previous manpower surpluses suddenly turned into shortages, and student deferment policies were tightened. The SSCQT was reinstated as a requirement for educational deferments in the spring of 1966, and the number of inductions tripled.

Further tightening continued in 1967. Additional constraints were placed on undergraduate and graduate students, but students in medical, dental, veterinary, osteopathy, and optometry schools were deferred upon evidence of satisfactory progress. In 1968, postgraduate deferments were extended *only* to students in the health professions schools, although graduate students were usually allowed to finish an uncompleted semester if drafted during the school year.

President Richard Nixon eliminated class II-S (college) deferments in 1971. Students in the II-S category during the academic year 1970–71 were permitted to remain in II-S so long as they qualified, but no new student deferments were granted. However, by 1971 the number of inductions was diminishing, and it was clear that the draft would soon end. The number of calls for induction in 1972 and early 1973 were minimal, and the draft was replaced by the all-volunteer army in 1973.

The effects of these events on college enrollments, degrees granted, and medical school applicants are examined in the following sections.

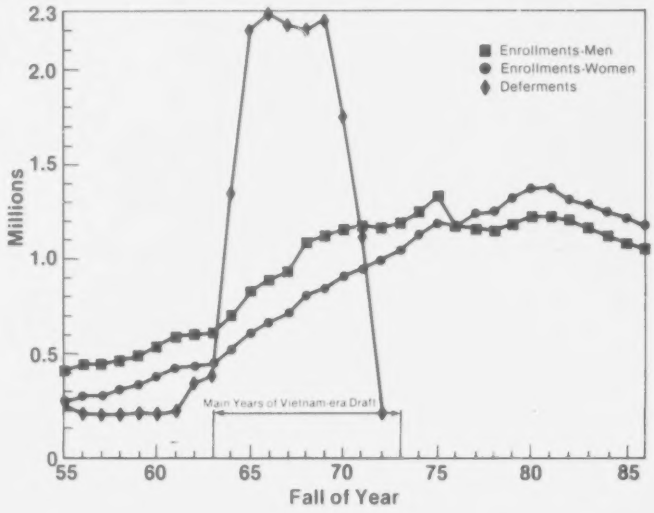

Figure 1. **Number of military draft deferments, 1955–1972, and number of first-time college enrollments for men and women, 1955–1986. (Source: Director of Selective Service; U.S. Bureau of the Census; and U.S. Department of Education)**

First-Time College Enrollments

From 1955 to 1963, the number of students enrolling in college for the first time showed steady growth of almost 5% per year for men and over 7% for women (Figure 1). For men this represented a steady-state growth about equal to the growth in the civilian population aged 18. For women during this period, college attendance increased at more than twice the rate of the growth of the civilian population aged 18.

During the Vietnam War era—roughly 1963 to 1972—the enrollments of both men and women freshmen showed accelerated growth. As can be seen in Figure 2, for men this represented a sharp increase relative to the civilian population aged 18, compared with the trend that had prevailed until 1963. After the draft effect had played itself out around 1976, women's freshman enrollment continued to increase through 1985 relative to the civilian population aged 18, while the men's ratio dropped to a lower, apparently steady-state level.

Bachelor's and Doctoral Degrees Granted

If college entrance rates were elevated as a result of the draft and deferment policies during the Vietnam War era, we should expect to see corresponding increases in bachelor's, master's, and doctorate (Ph.D. and equivalent) degrees awarded after a delay of several years. Figure 3 shows that the number of bachelor's degrees granted during the late 1960s and early 1970s did indeed take an upward swing. For men the upswing appears to have started around 1967 and peaked in 1974. The average growth rate during this period was 7.3% per year, considerably higher than the 5% annual growth rate that prevailed in the preceding ten years.

For women the growth rate in bachelor's degrees from 1967 to 1974 at 8.5% per year was even faster than that for men during this period but

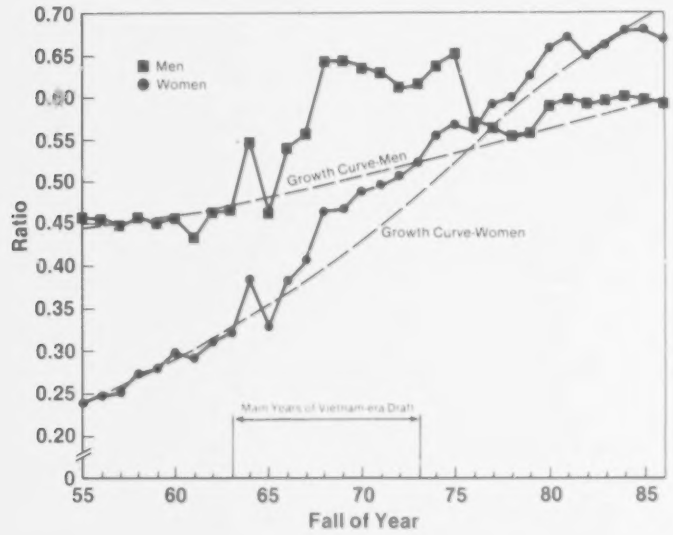

Figure 2. **Ratio of first-time college enrollments to the civilian population aged 18, 1955–1986. Growth curves were derived from data for 1955–1963 and 1977–1986 and estimate the pattern that would have occurred in the absence of the Vietnam War effect. (Source: U.S. Department of Education and U.S. Bureau of the Census)**

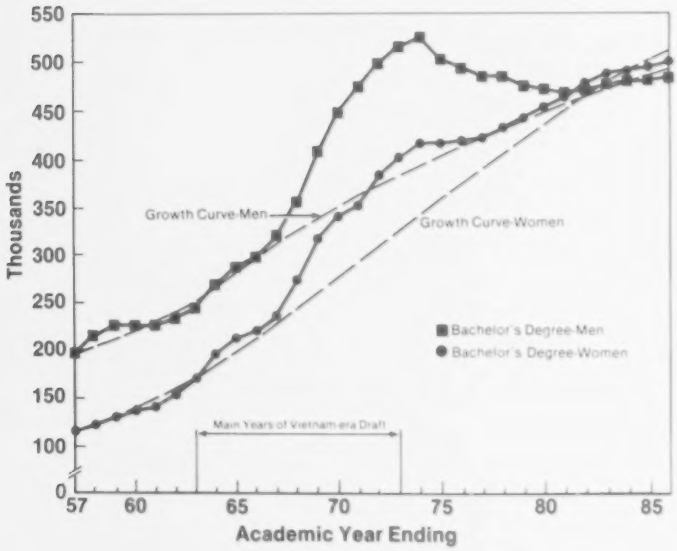

Figure 3. **Number of bachelor's degrees granted 1957–1986. Growth curves were derived from data for 1957–1967 and 1981–1986 and estimate the pattern that would have occurred in the absence of the Vietnam War effect. (Source: U.S. Department of Education)**

only slightly higher than the growth rate for women during the preceding decade, which was 7.3% per year. This is evidence that a strong movement for greater educational attainment by women had already begun before the Vietnam War era. The movement continued through the draft years at an accelerated pace until the mid-1970s, and then at a somewhat slower pace into the 1980s.

It should be noted that more than demographic effects are involved. We are witnessing some long-term changes in the traditional career choice patterns of men and women in the United States. Figure 4 shows clearly that in the past 30 years, the huge gap between men and women in numbers of bachelor's degrees attained relative to the population aged 20–24 has been completely closed.

Figure 4 also demonstrates most clearly the effect of the Vietnam War draft on men's attainment of bachelor's degrees, even after population effects have been factored out. The bulge in the ratio of men's degrees to the population aged 20–24 is much more pronounced than that for women for the period covering 1966 to 1976.

An equally pronounced effect of the draft on men's attainment of doctorates is shown in Figure 5. Since more than 90% of all Ph.D. recipients are between the ages of 25 and 44,[8] this group was used as the population base. The number of men who received doctorates relative to the civilian population in this age group began to accelerate rapidly in the early 1960s. It reached a peak of almost 1.2 doctorates per 1,000 men aged 25–44 in 1971 and has declined continuously since then.

In terms of women's doctorates, the Vietnam-War-era effect appeared later and was much smaller than that for men. The number of women receiving doctorates relative to the population aged 25–44 seems to have had a slight bulge over the expected growth rate during the period 1970 to 1983. Although the acceleration was not as rapid as that for men, the number of women's doctorates relative to the population aged 25–44 has remained high.

Professional School Applicants

Health professions schools of all types were the ultimate beneficiaries of the effect shown by the enrollment and degree patterns discussed above. The pattern of applicants to medical schools is shown in Figure 6.[9,10] Data on applicants to other health professions schools (shown in Figure 7) are not as well tabulated, but they also show declining trends for men and generally increasing trends for women in the late 1970s and 1980s.

From 1967 to the peak in 1974, the number of men applying to medical school increased at a rather startling rate of over 10% per year. Increases for dental school applicants were not far behind at 9% per year from 1967 to the peak year in 1975.[11-13] Since those peaks, the numbers of men applying to both medical and dental schools have declined steadily through 1986.

In osteopathic schools, the number of men applicants dropped 31% between 1977 and 1987 (from 3,359 to 2,316), while the number of women applicants increased by 79% (from 559 to 1,002) over that period.[14]

In veterinary colleges, the total number of applications has declined since 1976. The only available data on the genders of applicants show that the numbers of men and women applicants have both declined since 1981[15]; however, the rate of decline was much steeper for men than for women. Actually, the number of women applying to veterinary schools surpassed the number of men in 1983; by 1988, the ratio was 2,511 women applicants to 1,689 men applicants.

In law schools, the pattern was similar but less pronounced. The number of men applying declined by less than 9% between 1977 and 1986, and the number of women applying increased by 39% over that period.[16] Unfortunately, no data are available on law school applicants before 1977, so we can only speculate that the Vietnam War draft had some impact, but less than that on the health professions schools.

In most cases, the Vietnam War effect seems to have ended by the late 1970s. Figure 6 shows that if the pre-

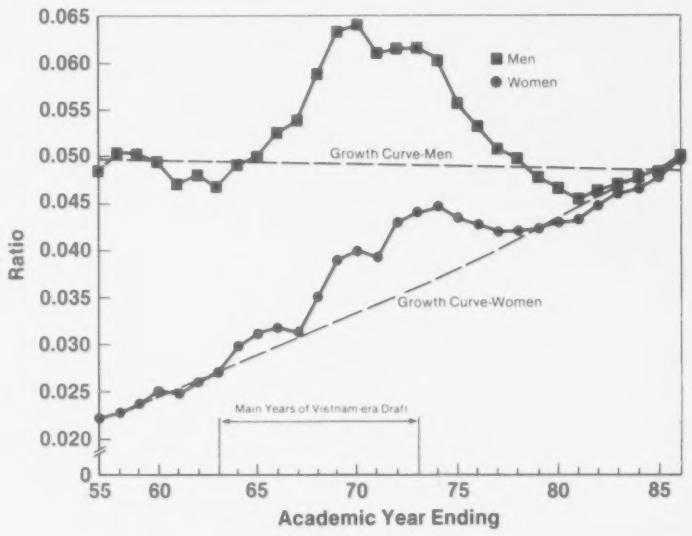

Figure 4. **Ratio of awarded bachelor's degrees to the civilian population (in thousands) aged 20–24 for the years 1957–1986. Growth curves were derived from data for 1957–1967 and 1981–1986 and estimate the pattern that would have occurred in the absence of the Vietnam War effect. (Source: U.S. Department of Education and U.S. Bureau of the Census)**

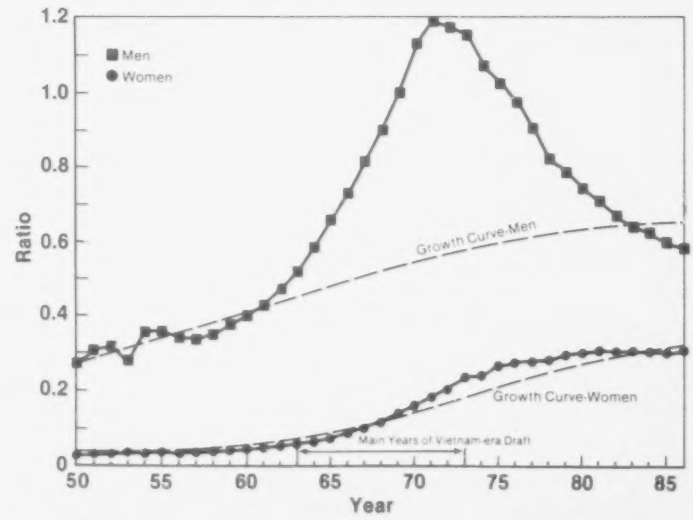

Figure 5. **Ratio of awarded doctoral degrees to the civilian population (in thousands) aged 25–44 for the years 1950–1986. The growth curve for men was derived from data for 1950–1962 and 1980–1986; the curve for women was from data for 1950–1986. These curves estimate the patterns that would have occurred in the absence of the Vietnam War effect. (Source: Harmon and Soldz, *Doctorate Production in U.S. Universities 1920–1962*; and U.S. Bureau of the Census)**

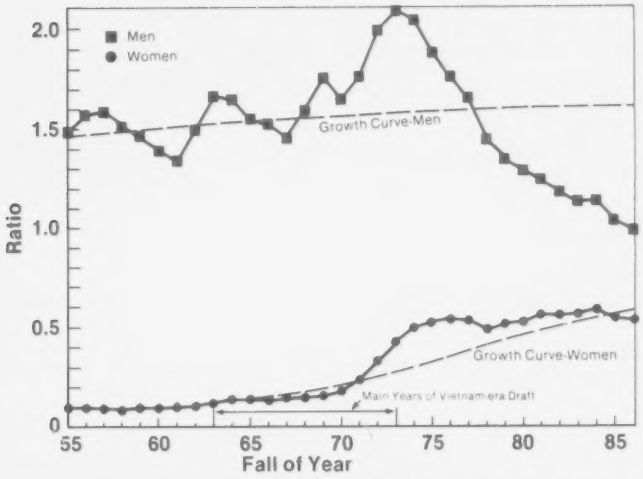

Figure 6. **Ratio of medical school applicants to civilian population (in thousands) aged 20–29 for the years 1955–1986. The growth curve for men was derived from data for 1955–1971 and 1978–1986; the curve for women was from data for 1950–1986. These curves estimate the patterns that would have occurred in the absence of the Vietnam War effect. (Source: Association of American Medical Colleges, *Data Book*; Johnson, *U.S. Medical Students 1950–2000: A Companion Factbook for "Physicians in the Making"*; and U.S. Bureau of the Census)**

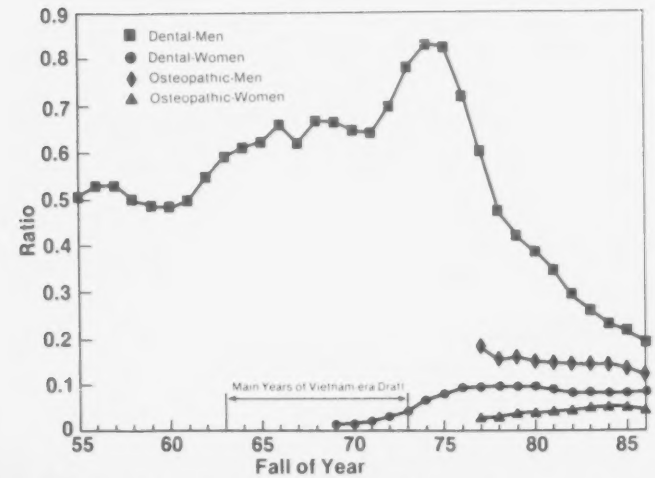

Figure 7. **Ratio of dental and osteopathic school applicants to civilian population (in thousands) aged 20–29 for the years 1955–1986. Data not available for all years. (Source: American Association of Dental Schools: American Dental Association; and American Association of Colleges of Osteopathic Medicine)**

Vietnam War trends had continued, the application rates of men would have returned to their long-term trend lines by approximately 1977. Why did they continue to fall while those of women stabilized? One answer is that men in large numbers avoided the main academic disciplines leading to the health professions schools—biology and chemistry—in favor of engineering, computer science, and business. The number of bachelor's degrees in biology granted to men reached a peak of 35,520 in 1976 and dropped to 19,993 by 1986; in chemistry, the number dropped from 8,659 to 6,483 during the same period. For women the pattern was different. The number of bachelor's degrees in biology granted to women reached a peak of 19,797 in 1978 and dropped just slightly to 18,531 by 1986; in chemistry the number actually increased steadily after 1950, reaching a peak of 3,791 in 1985.

These patterns help to explain the trends in numbers of applicants to medical and dental schools in the 1980s, but the deeper reasons for the flight of men from the biological and chemical sciences remains to be explained, as does the impact of tuition increases and debt on decisions to apply to medical school.

References

1. Director of Selective Service. *Annual Reports and Semi-Annual Reports.* Washington, D.C.: U.S. Government Printing Office, 1963–1972.
2. U.S. Department of Education, National Center for Education Statistics. *Digest of Education Statistics.* Washington, D.C.: U.S. Government Printing Office [annually since 1962].
3. U.S. Department of Education, National Center for Education Statistics. *Fall Enrollment in Higher Education* (formerly entitled *Opening Fall Enrollment*). Washington, D.C.: U.S. Government Printing Office [annually].
4. U.S. Bureau of the Census. Current Population Reports. Series P-25, Nos. 310, 311, 917, 1000. *Estimates of the Populations of the U.S. by Age, Sex, and Race.* Washington, D.C.: U.S. Government Printing Office, 1965, 1974, 1982, 1987.
5. U.S. Department of Education. *Earned Degrees Conferred.* Washington, D.C.: U.S. Government Printing Office [annually].

6. U.S. Department of Education, National Center for Education Statistics. *Projections of Education Statistics.* Washington, D.C.: U.S. Government Printing Office [annually].
7. Harmon, Lindsey, and Soldz, H. *Doctorate Production in U.S. Universities 1920–1962.* Washington, D.C.: National Research Council, 1963.
8. Harmon, Lindsey R. *A Century of Doctorates.* Washington, D.C.: National Academy of Sciences, 1978.
9. Association of American Medical Colleges. *Data Book* (Tabulations of Statistical Information Related to Medical Education). Washington, D.C.: [updated continuously].
10. Johnson, Davis G. *U.S. Medical Students 1950–2000. A Companion Factbook for "Physicians in the Making."* Washington, D.C.: Association of American Medical Colleges, 1983.
11. American Association of Dental Schools. *Applicant Analysis of Entering Class 1986 and 1987.* Washington, D.C.: AADS (undated).
12. Personal communication, Dr. Eric Solomon, American Association of Dental Schools, December 1988.
13. American Dental Association. *Trends in Enrollment and Academic Qualifications.* Chicago, Illinois: Division of Educational Measurements, ADA (undated).
14. Zobell, Don C. *Annual Report of the American Association of Colleges of Osteopathic Medicine, 1987.* Rockville, Maryland: AACOM, 1987.
15. Tasker, John B. *An Analysis of Applications to United States Colleges of Veterinary Medicine, 1988.* Washington, D.C.: American Association of Veterinary Medical Colleges, 1988.
16. Personal communication, William J. Kennish, vice-president for operations, Law School Admission Services, Newtown, Pennsylvania, February 1989.

Likelihood of Contact with AIDS Patients as a Factor in Medical Students' Residency Selections

ROBERTA NESS, M.D., M.P.H., CHARLES D. KILLIAN, M.A., DAVID E. NESS, M.D., JUDITH B. FROST, M.A., and DON McMAHON, M.A.

Abstract—Results from the National Resident Matching Program for the years 1980, 1983, and 1987 were used to examine changes over time in the matches of U.S. medical students to residencies in cities with high concentrations of patients with acquired immunodeficiency syndrome (AIDS) and to specialties in which the care of AIDS patients was most concentrated. Medical students seeking postgraduate training in categorical surgery residency programs were less likely to be matched with programs located in areas where the numbers of reported AIDS cases were high in 1987 as compared with the "pre-AIDS" years of 1980 or 1983. This trend was more pronounced for students from medical schools located in cities with high numbers of AIDS cases. There was a decline in matches to residencies in categorical internal medicine nationally, regardless of location; this decline was also greater among the students coming from medical schools in cities with high numbers of AIDS cases. The authors discuss the implications for medical educators of declines in matches to specialties in which the care of AIDS patients is most concentrated. The imperfect nature of available measures of students' exposure to AIDS patients makes the data of this study preliminary, and further studies are being undertaken. However, the finding of significant effects in spite of the imprecision of some measures suggests that future work will confirm the results of this study. *Acad. Med.* 64(1989):588–594.

During the 1980s there has been a dramatic yearly rise in the number of reported cases of acquired immunodeficiency syndrome (AIDS). Concurrently, some medical professionals have expressed concern and anxiety about taking care of patients who have AIDS[1,2] for such reasons as fear of contagion, homophobia, reluctance to take on a burdensome workload, and the knowledge that almost all AIDS patients die.[3–8] In some cases, physicians have refused to care for individuals with AIDS,[9,10] a behavior that has generated ethical debate within the medical community.[11–14] These attitudes and behaviors have also created concern that prospective physicians may attempt to avoid contact with AIDS patients in their careers by removing themselves from geographic areas or specialty training in which these patients may be concentrated.

Anecdotal reports suggest[15–17] that at least some medical students feel negatively toward AIDS patients and have refused to perform certain caregiving duties for them. However, we are aware of only two published studies about the potential impact of AIDS on the career decisions of medical students. In a New York City survey,[18] over 40% of the students felt that the presence of large numbers of AIDS patients would "reduce the scope and value of training offered" in a residency training program. Another survey,[19] in a Washington, D.C. medical school, disclosed that 27% of the students surveyed had considered changing their careers because they would be required to work with AIDS patients. It is not clear how widespread these attitudes are among students or to what extent they actually influence career choices.

We designed our study to explore the possible impact of AIDS upon medical students' choices of residency positions, as assessed by the results of students' selections in the National Resident Matching Program (NRMP). We tested two hypotheses. The first was that during the AIDS epidemic, students would be less attracted than they had been in previous years to the primary care specialties that provide the most care to AIDS patients, such as internal medicine; to higher-risk invasive specialties such as surgery; and to programs located in hospitals with high case-

Dr. Roberta Ness is research fellow, School of Public Health, and Dr. McMahon is director, Clinical Research Information Systems, Columbia University, New York, New York; Mr. Killian is senior research associate and director, Student and Applicant Information Management System, and Ms. Frost is research associate, Association of American Medical Colleges; and Dr. David Ness is assistant professor, the University of Pennsylvania School of Medicine, Department of Psychiatry, Philadelphia, Pennsylvania.

Correspondence and requests for reprints should be addressed to Mr. Killian, Association of American Medical Colleges, Suite 200, One Dupont Circle, NW, Washington, DC 20036.

loads of AIDS patients. The second hypothesis was that greater likelihood of contact with AIDS patients during medical school would be inversely associated with students' being matched to a residency program in which AIDS patients were common.

Method

The following section presents the data sources, variables, and analyses employed in this study.

Data Sources and Subjects

We employed data from two sources: the NRMP and the Association of American Medical Colleges' (AAMC) Student and Applicant Information Management System (SAIMS). We used the NRMP's complete databases of candidates matched for the years 1980, 1983, and 1987; these comprise data on schools of origin, hospital programs to which students were matched, and types of specialty programs that were selected by all students who were matched successfully during those years. Included were about 85% of all U.S. medical school graduates.[20-22] Only residency matches for the first year of postgraduate training were considered. The use of NRMP match results rather than students' actual choice lists was necessary because the NRMP keeps the choice list strictly confidential. We deemed the match results to be a valid indicator of preference because 57% of the students were matched to their first choice of residency and 83% were matched to one of their first three choices[23]; furthermore, students are aware that they are not guaranteed their first or even their second match choices, so that any choice within the top three must be acceptable to the student as a training program.

The SAIMS includes among its data elements students' sociodemographic data, academic history, questionnaire responses, and the results of the NRMP-AAMC joint tracking of residents. Of particular importance for this study were the responses of approximately two-thirds of all graduating seniors to the annual Graduation Questionnaire. These data were used to control for the effect of student sociodemographic characteristics by using items from the SAIMS database, including age, sex, ethnicity, marital status, number of dependents, total debt, MCAT scores, research interest, rural background, and desired practice setting. The effect of geographic proximity between medical school and residency sites was controlled by a propinquity indicator that was defined as "1" for students matching to the same region as that of their medical school and "0" for others. The United States was classified into nine geographic regions based on the American Medical Association's (AMA) definitions of these regions.[24]

Definition of Variables

Matches in the pre-AIDS years 1980 and 1983 were compared with matches in the post-AIDS year 1987. We chose 1980 for two reasons: it represents the first year that match results were computerized by the NRMP, and it was the year preceding the first reports of AIDS as a disease entity.[25,26] We chose 1983 because it was the first year that data from the joint NRMP-AAMC residency tracking project were available, and so it was the first year in which we could control for student demographic factors in our multivariate analyses. There are no data to suggest, and there is little reason to believe, that at the outset of 1983 AIDS was a factor in medical students' residency choices. In that year the outbreak was limited to a cumulative total of 878 reported cases nationally,[27] there had been no reports of transmission to hospital personnel (indeed AIDS had not been shown to be caused by an infectious agent), and the case mortality rate was estimated at just over 50%. Thus, the reasons for the concerns voiced later—contagion, burdensome workload, and the high fatality rates of AIDS patients—would have been unknown in early 1983. In contrast, by the beginning of 1987 more than 28,000 cases of AIDS had been reported,[28] and concerns among the medical profession toward caring for these patients had been broadly publicized.

We compared changes between the pre-AIDS years of 1980 and 1983 and the post-AIDS year of 1987 in U.S. graduates' match rates to residencies in areas of the country where medical students would be more likely to be exposed to large numbers of AIDS patients and also to residencies in areas where exposure would be less likely. Because AIDS case counts are not available for all individual medical schools and residencies, we classified institutions as being in areas with high or low frequencies of reported AIDS cases by using the 1986 year-end new case counts for each Standard Metropolitan Statistical Area (SMSA) provided by the Centers for Disease Control (CDC).[28] (See Table 1.) These numbers were used as estimates of cumulative incidences of AIDS in the clinical populations to which the students who were matched in 1987 would have been exposed.

Given the imprecision of current measures of students' exposure to AIDS, the observed effects are probably underestimated in the present study. We anticipate that the use at the institutional level, of more refined measures, of AIDS exposure will demonstrate stronger trends. We are now conducting a study in which we use AIDS case counts by institution to define students' exposures.

For the purposes of the present study, for all three of the years studied, each medical school and residency in the match was assigned the 1986 year-end number of AIDS cases in its SMSA. Thus, institutions in areas with high numbers of AIDS cases in 1987 were assigned the same high numbers of such cases for 1980 and 1983, so that the behavior of students in a given location in a post-AIDS year could be compared with the behavior of students in the same location in pre-AIDS years.

In stratified bivariate analyses a dichotomous measure of AIDS cumulative incidence was used. The 20 cities with the greatest numbers of new cases of AIDS per year were compared with all other cities. An interval measure was used in the regression models whereby actual case counts

Table 1

Numbers of Cases of AIDS in 20 Standard Metropolitan Statistical Areas (SMSAs) and the Populations of These Areas, 1986*

SMSA of AIDS Cases	No. AIDS Cases	Population (in millions)
New York, N.Y.	3,423	9.12
San Francisco, Cal.	1,347	3.25
Los Angeles, Cal.	1,294	7.48
Houston, Tex.	567	2.91
Washington, D.C.	436	3.06
Miami, Fla.	394	1.63
Chicago, Ill.	379	7.10
Newark, N.J.	340	1.97
Dallas, Tex.	332	2.97
Philadelphia, Pa.	304	4.72
Atlanta, Ga.	261	2.03
San Diego, Cal.	212	1.86
Boston, Mass.	211	2.76
Ft Lauderdale, Fla.	203	1.02
Nassau-Suffolk, N.Y.	183	2.61
Jersey City, N.J.	168	0.56
Seattle, Wash.	174	1.61
New Orleans, La.	144	1.19
Baltimore, Md.	131	2.17
Denver, Colo.	129	1.62
Total for SMSAs	10,632	61.63
Total for the rest of the U.S.	4,382	168.48
Combined total	15,014	230.11

*The table shows all known cases in 1986 by date of diagnosis rather than date of report. The data are for the 20 SMSAs with the highest case counts as compiled by the Centers for Disease Control.

per city were applied to the 20 cities with the highest AIDS frequencies "high-AIDS locations" as compared with all other cities. (See Table 1.) This allowed a more precise ranking of cities by numbers of cases.

Specialties were defined on the basis of the NRMP codes for the appropriate year.[29,30] The surgical subspecialties included for this analysis were neurosurgery, plastic surgery, otolaryngology, ophthalmology, and orthopedic surgery. The radiology/nuclear medicine subspecialties included were diagnostic radiology, therapeutic radiology, and nuclear medicine.

Analysis

We first compared the proportions of the students in the pre-AIDS years and post-AIDS year who chose each specialty. The proportion of the students choosing a given specialty in the post-AIDS year was divided by the proportion choosing that specialty in a pre-AIDS year in order to determine the relative proportions being matched to that specialty; in an epidemiologic context, these measures are equivalent to relative risks. In a similar manner we determined the relative proportions being matched to a high-AIDS location in the pre-AIDS years as compared with the post-AIDS year. Because the choice of specialty and the choice of location are interdependent, we also determined the relative proportion of students matching to a high-AIDS hospital in each specialty over time. The sample was then stratified into students from high- and low-AIDS medical schools (that is, medical schools in SMSAs in which the numbers of AIDS cases were relatively greater or less) and relative proportions were compared between these strata. A chi-square test of homogeneity[31] was used to test for differences between the relative risks of strata; the null hypothesis was that there was no difference between the relative proportions of matches by students from high-AIDS versus low-AIDS medical schools. The results of these and the multivariate analyses are discussed.

Ordinary least-squares multiple-regression models were used to control for factors in the socio-demographic backgrounds of students, including the propinquity indicator, all of which may have played roles in residency decisions. City-specific AIDS cumulative incidence at the hospital of residency was regressed on a set of inclusive independent variables, with the exception of a variable indicating the impact of exposure to AIDS in medical school. In the next stage, the unexplained residual variance from the first equation was regressed onto the variable indicating exposure to AIDS in medical school. This two-stage modeling approach was designed to isolate the effect of school AIDS exposure on choice of a high-AIDS residency program. A specialty and school interaction term also was entered into the second stage of the modeling.

Results

In 1980, 12,486 U.S. graduating medical students were matched through the NRMP and met the criteria for inclusion in this study. In 1983, the number of such students was 12,874, and in 1987, 13,941.

AIDS and Choice of Geographic Location of Residency

We first attempted to determine whether U.S. medical school graduates were influenced by the numbers of AIDS patients in the geographic locations of their residencies. Table 2 shows the numbers and percentages of students matching to various types of residency programs in high-AIDS locations and low-AIDS locations in 1980 and 1987. The proportions of matches to residencies in designated

high-AIDS locations in 1987 as compared with 1980 defined the relative proportions of students matching to high-AIDS areas and are shown in Table 3. Students matching to categorical surgery programs were significantly less likely to choose a residency program located in a high-AIDS area in 1987 (relative proportion, 0.86; 95% confidence interval, 0.79–0.94). The decline in matches to high-AIDS surgical residencies was significant for students from high-AIDS schools (relative proportion, 0.86; 95% confidence interval, 0.79–0.93) but not significant for students from low-AIDS schools (relative proportion, 0.92; 95% confidence interval 0.77–1.09). Controlling for the numbers of positions available in surgical programs in different locations did not alter these findings. The only other program in which matches to high-AIDS residencies declined significantly over time was radiology, a finding accounted for by fewer residency slots in 1987 in high-AIDS locations.

Table 2

Numbers and Percentages of Students, in Terms of the Specialties They Chose, Who Were Matched to Residency Programs in Locations with High and Low Numbers of AIDS Patients, 1980 and 1987*

	Matched to Residencies in High-AIDS Locations†				Matched to Residencies in Low-AIDS Locations†			
	1980		1987		1980		1987	
Specialty	No.	%	No.	%	No.	%	No.	%
Internal medicine, categorical	1,793	48.1	1,617	46.8	1,932	51.9	1,837	53.2
Surgery, categorical	525	51.6	504	44.5	493	48.4	628	55.5
Family practice	297	17.6	352	19.9	1393	82.4	1418	80.1
Pediatrics, categorical	502	44.2	641	47.2	633	55.8	718	52.8
Obstetrics and gynecology	334	43.2	388	44.8	439	56.8	478	55.2
Psychiatry, categorical	220	53.4	326	47.7	192	46.6	358	52.3
Pathology	112	50.5	102	46.6	110	49.5	117	53.4
Radiology/nuclear medicine	98	34.3	47	19.4	188	65.7	195	80.6
Surgical subspecialties	139	39.3	188	35.7	215	60.7	339	64.3
Transitional‡	314	31.2	387	39.6	693	68.8	590	60.4
Total, all students	5,160	41.3	5,906	42.4	7,326	58.7	8,035	57.6

*Data are from the National Resident Matching Program databases on candidates matched in 1980 (12,486 students) and in 1987 (13,941 students).

†The locations of the residency programs were classified as being in areas of high or low frequencies of reported AIDS cases by using the Centers for Disease Control's year-end case counts for each Standard Metropolitan Statistical Area.

‡Transitional specialties are designed to expose students to several clinical disciplines, thereby facilitating their preparation for a particular specialty.

Table 3

Relative Proportions, by Specialty, of 1987 Students (Compared with 1980 students) Who Were Matched to Residency Programs in Locations with High Numbers of AIDS Patients—Overall and in Terms of the Locations of Their Medical Schools*

	All Students		Students from Schools in Locations with High Numbers of AIDS Patients		Students from Schools in Locations with Low Numbers of AIDS Patients	
Specialty	Proportion†	Confidence Interval	Proportion†	Confidence Interval	Proportion†	Confidence Interval
Internal medicine, categorical	0.97	0.93–1.02	1.04	1.00–1.09	0.95	0.86–1.05
Surgery, categorical	0.86‡	0.79–0.94	0.86‡	0.79–0.93	0.92	0.77–1.09
Family practice	1.13	0.98–1.30	1.26‡	1.07–1.49	1.03	0.82–1.28
Pediatrics, categorical	1.07	0.98–1.16	1.03	0.96–1.11	1.17	0.98–1.40
Obstetrics and gynecology	1.04	0.93–1.16	1.05	0.96–1.16	1.20	0.95–1.51
Psychiatry, categorical	0.89	0.79–1.01	0.96	0.86–1.06	0.96	0.76–1.22
Pathology	0.92	0.76–1.12	1.04	0.91–1.20	0.82	0.59–1.15
Radiology/nuclear medicine	0.57‡	0.42–0.77	0.74	0.54–1.03	0.63	0.39–1.02
Surgical subspecialties	0.91	0.76–1.08	0.86	0.74–1.00	0.82	0.57–1.19
Transitional§	1.27	1.13–1.43	1.23	1.10–1.38	1.20	0.97–1.49
Anesthesia	1.18	0.91–1.52	1.20	0.96–1.51	0.82	0.51–1.30
Total, all students	1.03	1.00–1.05	1.05‡	1.02–1.08	1.03	0.97–1.09

*Data are from the National Residency Matching Program databases on candidates matched in 1980 (12,486 students) and in 1987 (13,941 students). The locations of the residency programs and of the schools were classified as being in areas of high or low frequencies of reported AIDS cases by using the Centers for Disease Control's year-end case counts for each Standard Metropolitan Statistical Area.

†The relative proportion is computed by dividing the percentage of students matched in 1987 to residency programs in high-AIDS locations by the percentage of students matched in 1980 to such programs.

‡The 95% confidence interval excludes 1.0.

§Transitional specialties are designed to expose students to several clinical disciplines, thereby facilitating their preparation for a particular specialty.

Table 4

Relative Proportions of 1987 Students (Compared with 1980 Students) Who Were Matched to Given Specialties in All Locations — in Terms of the Locations of Their Medical Schools*

Specialty	Students from Schools in Locations with High Numbers of AIDS Patients		Students from Schools in Locations with Low Numbers of AIDS Patients	
	Proportion†	Confidence interval	Proportion†	Confidence interval
Internal medicine, categorical§	0.78‡	0.74–0.83	0.88‡	0.83–0.93
Surgery, categorical	0.99	0.87–1.12	1.01	0.90–1.12
Family practice	0.92	0.82–1.04	0.93	0.87–1.00
Pediatrics, categorical	1.09	0.97–1.23	1.06	0.96–1.17
Obstetrics and gynecology	0.92	0.80–1.07	1.06	0.94–1.21
Psychiatry, categorical§	1.27‡	1.06–1.52	1.67‡	1.42–1.96
Pathology	0.88	0.63–1.22	0.88	0.70–1.10
Radiology§	0.48‡	0.35–0.68	0.89	0.73–1.08
Surgical subspecialties	1.58‡	1.28–1.94	1.18	1.00–1.41
Transitional‖	0.99	0.86–1.14	0.80‡	0.72–0.89
Anesthesiology	1.30	0.94–1.81	0.84	0.68–1.04

*Data are from the National Residency Matching Program databases on candidates matched in 1980 (12,486 students) and in 1987 (13,941 students). The locations of the schools were classified as being in areas of high or low frequencies of reported AIDS cases by using the Centers for Disease Control's year-end case counts for each Standard Metropolitan Statistical Area.

†The relative proportion is computed by dividing the percentage of students matched in 1987 to a given specialty by the percentage of students matched in 1980 to the same specialty.

‡The 95% confidence interval excludes 1.0.

§The test for the difference between relative proportions is significant at the level of $p < .05$.

‖Transitional specialties are designed to expose students to several clinical disciplines, thereby facilitating their preparation for a particular specialty.

In order to verify the finding that students from high-AIDS medical schools were less attracted to categorical surgical residencies in high-AIDS locations over time, we considered the interaction between choosing a categorical surgery program and originating from a high-AIDS medical school in a multivariate model. After controlling for students' background factors (derived from the SAIMS data-base), students from high-AIDS medical schools who chose categorical surgery programs in 1983 were significantly more attracted to residencies in high-AIDS locations (beta = 0.165, $p < .0001$) than were students choosing surgery in 1987 (beta = 0.037, $p > .05$). Thus, evidence from the multivariate analysis corroborated that from the bivariate analyses.

AIDS and Specialty Choice

We next examined the frequencies of student matches to specific specialties, regardless of location. Table 4 shows the relative proportions of students matching to given specialties in 1987 and in 1980; the table is separated into figures for those students originating from high- and low-AIDS-designated medical schools. The proportion of students matching to categorical internal medicine dropped from 1980 to 1987. This drop was greater for students from high-AIDS medical schools — as shown by the smaller ($X^2 = 7.29$; $p < .01$) relative proportion of matches among students from these schools (relative proportion, 0.78; 95% confidence interval, 0.74–0.83) — than among students from low-AIDS medical schools (relative proportion, 0.88; 95% confidence interval, 0.83–0.93). These differences could not be accounted for by changes in the numbers of positions available in categorical internal medicine in high- and in low-AIDS areas.

Table 4 also shows significant decreases between 1980 and 1987 for students matching to radiology (from high-AIDS areas) and to transitional programs (from low-AIDS areas). However, there were fewer 1987 residency slots available in locations where there were apparent declines. After controlling for the number of available positions, differences in the proportions of students matching over time to these specialties disappeared.

Since AIDS is most prevalent in large cities, and since some medical students who are selecting a residency may wish to avoid large cities in any case, it was desirable to try to remove the effect of being located in a city from the analysis. We compared the behavior of medical school graduates from high- and low-AIDS medical schools within selected cities having populations of over three million.[32] Categorical internal medicine's portion of the match declined significantly between 1987 and 1980, both for students from high-AIDS cities (relative proportion, 0.66; 95% confidence interval, 0.60–0.73) and for students from low-AIDS cities (relative proportion, 0.80; 95% confidence interval, 0.69–0.91). The relative proportion of students choosing internal medicine from high-AIDS cities was significantly lower than that for students from low-AIDS cities ($X^2 = 4.58$, $p < .05$). Thus, even after controlling for the effect of city location, students from high-AIDS schools were disproportionately less likely to match to categorical internal medicine programs.

Discussion

To our knowledge, these are the first published data on the possible impact of AIDS on medical student career selection behaviors. The findings that there were decreases in matching to categorical surgical programs in high-AIDS areas, and in matching to categorical internal medicine programs nationally, were consistent with our hypotheses. Surgery is the specialty that brings physicians into the greatest contact with potentially infective body fluids, while internal medicine is the specialty most likely in cities to provide care for patients who present with chronic and multiple organ system illnesses such as AIDS.

That AIDS is a factor in these trends is supported by attitudinal surveys and anecdotal evidence that

show that some medical students may feel less attracted to residency programs that require caring for large numbers of AIDS patients,[18,19] and that some residents in high-AIDS medicine and pediatrics programs might choose differently if they had to select a residency again.[4] Fear of contagion and homophobia have been suggested as reasons for these attitudes.[17,18] We suggest that the generally young age and the emotional and physical neediness of AIDS patients, and the fact that they are all terminally ill, may also contribute to the reluctance of physicians-in-training to work extensively with them. For some medical students, the issue may be not one of avoiding AIDS patients altogether, but of avoiding certain residencies where their clinical experience would be likely to be dominated by such patients.

While factors other than likelihood of contact with AIDS patients might be contributing to these trends, our study was designed to limit such alternative explanatory factors to those that would be influencing students' residency decisions over the same time period and in the same specific geographic areas. In addition, we controlled for factors known from other studies to have an influence upon residency selection, such as student demographic factors[33] and changes in the number of available residency positions.

However, one alternative factor that could explain our results is a possible response of the students to the urban nature of the residency areas; these urban areas were also the places where there were many AIDS patients. The students may well have been discouraged from selecting large cities and certain specialties by their high costs of living and relatively low salaries, and the competition in cities among physicians practicing internal medicine as compared with other specialties. Although we found that even when we considered only densely populated urban areas, students from high-AIDS cities were less likely to choose categorical internal medicine than those from low-AIDS cities, we still cannot exclude the possibility that the influence of the urban environments in high-AIDS cities was different from that in low-AIDS cities.

Several methodologic limitations of the current study must be kept in mind. First, since we were limited to using currently available data, certain of our measures were of necessity imprecise. Figures on the incidence of AIDS patients were not available for each individual medical school and residency; thus, we used AIDS frequencies of the SMSAs in which programs were located. This inevitably resulted in some misclassification of the degrees of students' exposures to AIDS cases. However, assuming that this misclassification was not greater for students from schools of either high- or low-AIDS designation, such misclassification would tend to attenuate a relative risk (relative proportion) towards 1.0,[34] so that our findings would be an underestimation of real effects.

Second, because students' individually ranked residency choices were not available to us, we used match outcomes as the measure of student behavior. On the one hand, these were imperfectly correlated with students' ranked choices. On the other hand, they represent choices of specialty and location that had to be acceptable to medical students for training; thus, we believe that they are meaningful substitutes for individual rankings.

Finally, we were able only imperfectly to isolate the effect of the likelihood of contact with AIDS patients on residency choice behavior by controlling for potentially confounding student background factors in multiple-regression models. We believe that our lack of success in predicting the choice of categorical internal medicine with these variables stems from the heterogeneity of the group of students choosing this specialty track. These students go on to select careers as diverse as general practice and institutional research. We also did not have information on practice-related factors that may affect specialty choice, such as economic conditions, hospital working milieu, and research environment within high- versus low-AIDS areas.

The importance of our work is in the demonstration of a movement away from specialties and locations in which the care of AIDS patients is concentrated, no matter what the cause. The care of AIDS patients requires an adequate supply of physicians in the specialties needed for such care and in the locations where these patients are found. Further research is crucial to confirm these preliminary findings and to separate the effects of AIDS from other effects intrinsic to urban environments. We must then concentrate on whether there are factors that might attract prospective residents to high-AIDS programs, such as educational or support programs, special academically-enriched AIDS wards, or available hospice care for patients. The institution of educational and supportive programs for medical students and residents should not wait for the results of future research. Creating good programs can only enhance the experience, and thus the appeal, of caring for AIDS patients, and can only improve the humane quality of medical education generally.

The authors thank Jennifer Kelsey, Ph.D., Steven Shea, M.D., Steven Ng, M.B., Dr.P.H., and Robert F. Jones, Ph.D., for their invaluable suggestions during the course of this study and for their review of the manuscript. This study was made possible through the generosity of the National Resident Matching Program, which made computer tapes available to us, and the Association of American Medical Colleges, which donated staff time and computer support. Funding came from the Department of Internal Medicine, Columbia-Presbyterian Medical Center, New York, New York.

References

1. Scherr L. AIDS—A Critical Test for Medicine. *A.C.P. Observer* **7**(1987):2.
2. Wertz, D. C., Sorenson, J. R., Liebling, L., Kessler, L., and Heeren, T. C. Knowledge and Attitudes of AIDS in Health Care Providers before and after Education Programs. *Public Health Rep.* **102**(1987): 248–254.
3. Wachter, R. M. The Impact of the Acquired Immunodeficiency Syndrome on Medical Residency Training. *N. Engl. J. Med.* **314**(1986):177–180.
4. Link, R. N. Feingold, A. R., Charap, M. H., Freeman, K., and Sholar, S. P. Concerns of Medical and Pediatric House Officers about Acquiring AIDS from Their Patients. *Am. J. Public Health* **78**(1988): 455–459.

5. Holz, H., Dobro, J., Palinkas, R., Kapila, R., and Oleshe, J. Psychosocial Impact of the Acquired Immune Deficiency Syndrome. *JAMA* **250**(1983):167.
6. Treiber, F. A., Shaw, D., and Malcolm, R. Acquired Immune Deficiency Syndrome: Psychological Impact on Health Personnel. *J. Nerv. Ment. Dis.* **175**(1987):496–499.
7. Douglas, C. J., Kalman, C. M., and Kalman, T. P. Homophobia among Physicians and Nurses: An Empirical Study. *Hosp. Community Psychiatry* **36**(1985):1309–1311.
8. Pearson, S. D. A Piece of My Mind: Immune Response. *JAMA* **256**(1986):3088.
9. Guy, P. J. AIDS: A Doctor's Duty. *Br. Med. J.* **294**(1987):445.
10. Shrank, A. AIDS: A Doctor's Duty (letter). *Br. Med. J.* **294**(1987):445.
11. Pellegrino, E. Altruism, Self-Interest, and Medical Ethics. *JAMA* **258**(1987):1939–1940.
12. Health and Public Policy Committee. Acquired Immunodeficiency Syndrome. *Ann. Intern. Med.* **104**(1986):575–581.
13. Emanuel, E. J. Do Physicians Have an Obligation to Treat Patients with AIDS? *N. Engl. J. Med.* **318**(1988):1686–1690.
14. Association of American Medical Colleges. Policy Guidelines for Addressing HIV Infection in the Academic Medical Community. *Acad. Med.* **64**(1989):335–348.
15. Elford, J. Moral and Social Aspects of AIDS: A Medial Students' Project. *Soc. Sci. Med.* **24**(1987):543–549.
16. Whalen, J. P. Participation of Medical Students in the Care of Patients with AIDS. *J. Med. Educ.* **62**(1987):53–54.
17. Kelly, A. J., St. Lawrence, J. S., Smith, S., Hood, H. V., and Cook, D. O. Medical Students' Attitudes toward AIDS and Homosexual Patients. *J. Med. Educ.* **62**(1987):549–556.
18. Imperato, P. J., Feldman, J. G., Nayeri, K., and DeHovitz, J. A. Medical Students' Attitudes towards Caring for Patients with AIDS in a High-Incidence Area. *N.Y. State J. Med.* **88**(1988):223–227.
19. Klug, J. AIDS Fears Affect Medical Students' Career Moves. *Clinical Psychiatr. News* **2**(1988):2,21.
20. *Listing of Candidates Who Matched Under NRMP for 1987 Appointments.* Evanston, Illinois: National Resident Matching Program, 1987.
21. *Listing of Candidates Who Matched Under NRMP for 1980 Appointments.* Evanston, Illinois: National Resident Matching Program, 1980.
22. Graettinger, J. S. Internal Medicine in the National Resident Matching Program 1987: The Ides of March. *Ann. Intern. Med.* **108**(1988):101–115.
23. *NRMP Data: April 1987.* Evanston, Illinois: National Resident Matching Program, 1987.
24. Gonzalez, M. L., and Emmons, D. W. *Socioeconomic Characteristics of Medical Practice 1987.* Chicago, Illinois: American Medical Association, 1987.
25. Centers for Disease Control. Pneumocystis Pneumonia—Los Angeles. *Morbid. Mortal. Weekly Rep.* **30**(1981):250–252.
26. Centers for Disease Control. Kaposi's Sarcoma and Pneumocystis Pneumonia among Homosexual Men—New York City and California. *Morbid. Mortal. Weekly Rep.* **30**(1981):305–308.
27. Centers for Disease Control. Update. Acquired Immunodeficiency Syndrome—United States. *Morbid. Mortal. Weekly Report* **35**(1986):757–765.
28. AIDS Program, Center for Infectious Diseases. *AIDS Weekly Surveillance Report—Week of December 28, 1987.* Atlanta, Georgia: U.S. Centers for Disease Control, 1987.
29. National Resident Matching Program. *1980 Results. Number of Candidates Sought and Number Matched for Each Participating Hospital and Unfilled Programs by Specialty.* Evanston, Illinois: N.R.M.P., 1980.
30. National Resident Matching Program. *1987 Results. Number of Candidates Sought and Number Matched for Each Hospital and Unfilled Programs by Specialty.* Evanston, Illinois: N.R.M.P., 1987.
31. Rothman, K. J. *Modern Epidemiology.* Boston: Little, Brown and Co, 1986.
32. *Vital Statistics of the United States.* Washington, D.C.: U.S. Bureau of the Census, 1987, p. 537.
33. Ernst, R. L., and Yett, D. E. Physician Location and Specialty Choice. Ann Arbor, Michigan: Health Administration Press, 1985.
34. Fleiss, J. L. *Statistical Methods for Rates and Proportions.* New York: John Wiley, 1981.

Racial-Ethnic Background and Specialty Choice: A Study of U.S. Medical School Graduates in 1987

DAVID BABBOTT, M.D., DEWITT C. BALDWIN, JR., M.D., CHARLES D. KILLIAN, M.A., and SHEILA O'LEARY WEAVER, M.S.

Abstract—This study used two Association of American Medical Colleges' questionnaires to determine whether there was a relationship between the racial-ethnic backgrounds and the specialty choices of a 1987 cohort of 11,136 U.S. medical school seniors, both prior to entering medical school and as they prepared for residency training. Their specialty preferences as premedical students were shown by their responses to the Premedical Student Questionnaire, administered when they registered for the Medical College Admission Test; their specialty choices at the end of their medical school training were shown by their responses to the Medical Student Graduation Questionnaire, which they completed shortly before graduation. Racial-ethnic backgrounds, self-recorded, were classified into black, other underrepresented minorities, Asian, other non-underrepresented minorities, and white. Specialties were clustered into primary care, medical specialties, surgical specialties, and supporting services. Before entering medical school, the students had similar specialty preferences regardless of background. As seniors in medical school, there was even greater convergence of specialty choices among the students of all backgrounds. Racial-ethnic background in itself appears not to have been a major factor influencing the senior medical students' specialty choices. *Acad. Med.* 64(1989):595–599.

The Association of American Medical Colleges (AAMC) annually surveys specialty plans of U.S. medical school seniors in the United States by means of the Medical Student Graduation Questionnaire (GQ), which is administered shortly before the students complete their National Resident Matching Program rank lists. Data derived from these surveys are incorporated into the AAMC's Student and Applicant Information Management System (SAIMS).[1] This comprehensive data bank contains information on all applicants to and students enrolled in U.S. medical schools, and on all residents in accredited U.S. residency programs. These data, in turn, may be linked to the AAMC Faculty Roster System and to the American Medical Association Physician Masterfile in order to study large numbers of physicians over extended periods of time.

A recent study[2] used SAIMS data to trace the development of early specialty preferences of U.S. medical school seniors in 1983 from the time they completed the Premedical Student Questionnaire (PSQ), administered when they registered for the Medical College Admission Test (MCAT), until they completed the GQ a few months before they graduated from medical school. The present study used SAIMS data concerning U.S. medical school seniors in 1987 in order to gain insight into the specialty aspirations of students in minority groups before they entered medical school, and to analyze the specialty choices of the same students as they prepared for residency training.

Method

The current study used SAIMS data comparable to those that formed the basis for the earlier 1983 study[2]: information obtained on the 1987 cohort from the PSQ, obtained when they registered for the MCAT as premedical students, and information from the GQ, which they completed as seniors in medical school. The method used to determine PSQ and GQ specialty interests was also the same as that in the 1983 study. In addition to specialty interests, each student's gender and racial-ethnic background were self-recorded.

Essentially all applicants to medical school take the MCAT and complete the PSQ; they are informed in writing that anonymity is guaranteed and that individual results are not forwarded to medical school admissions committees. The GQ is distributed to all U.S. medical school seniors through deans' offices; approximately two-thirds of all seniors respond to this survey.

The 7,525 men and 3,611 women in the class of 1987 who indicated specialty interests and ethnic backgrounds represented 70% of all U.S medical school graduates that year. The ratio of 67.6% men to 32.4% women in the cohort was almost identical to the ratio of 67.9% men to 32.1% women found among all U.S. medical school graduates in 1987. Data are not yet available to compare the various ethnic-racial groups' GQ specialty choices with their actual first-year residency appointments in 1987. Furthermore, because specialty plans of nonresponders to the GQ were not studied, it is possible that the 70% sample on which this study is

Dr. Babbott is professor, Department of Medicine, and Ms. Weaver is biostatistician, Department of Medical Biostatistics, both at the University of Vermont College of Medicine, Burlington; Dr. Baldwin is director, Division of Medical Education and Information, American Medical Association, Chicago, Illinois; and Mr. Killian is senior research associate and director, Student and Applicant Information Management System, Association of American Medical Colleges, Washington, D.C.

Correspondence and requests for reprints should be addressed to Dr. Babbott, Department of Medicine, University of Vermont College of Medicine, Burlington, VT 05405.

Table 1

Numbers and Percentages, by Racial-Ethnic Background and Gender, of 11,136 Medical School Seniors, 1987*

Racial-Ethnic Background	Men		Women		Combined	
	No.	%	No.	%	No.	%
Underrepresented minorities†						
Black	252	3.3	201	5.6	453	4.1
Mainland Puerto Rican	31	0.4	19	0.5	50	0.4
Mexican American	93	1.2	43	1.2	136	1.2
Native American	28	0.4	19	0.5	47	0.4
Subtotal	404	5.4§	282	7.8	686	6.2§
Non-underrepresented minorities‡						
Asian	422	5.6	236	6.5	658	5.9
Commonwealth Puerto Rican	100	1.3	50	1.4	150	1.3
Other Hispanic	127	1.7	49	1.4	176	1.6
Subtotal	649	8.6	335	9.3	984	8.8
White	6,472	86.0	2,994	82.9	9,466	85.0
Total	7,525	100	3,611	100	11,136	100

*Data obtained from the students' responses, as premedical students, to the Premedical Student Questionnaire, administered at the time they registered for the Medical College Admission Test.

†Underrepresented minorities are those whose representations in the physician population are less than their representations in the total population.

‡Non-underrepresented minorities are those whose representations in the physician population are equal to or greater than their representations in the total population.

§This subtotal is not the exact sum of the numbers that compose it because some of them were rounded.

based does not accurately reflect all medical school graduates in 1987.

There are two studies of U.S. medical school graduates, however, that suggest that data derived from the 1983 GQ are reliable and valid. Babbott, Baldwin, and Jolly reported[2] that the proportions of GQ respondents planning residencies in family practice, pediatrics, surgery, psychiatry, and obstetrics and gynecology closely approximated the proportions of all 1983 U.S. medical school graduates who subsequently matched to these residencies. Dial and Elliott, in their study[3] of indebtedness and career plans of U.S. medical school graduates in 1983, reported that mean indebtedness of respondents to the GQ differed by only 0.7% from the mean indebtedness of the cohort, as determined by a 1983 survey of the Liaison Committee on Medical Education.

The 51 specialty options listed in the 1983 GQ[4] were classified into four major specialty categories: primary care, medical specialties, surgical specialties, and supporting services. Primary care included the three specialties that provide comprehensive and continuing care to both men and women: family practice, general internal medicine, and general pediatrics. The medical specialties option encompassed the 11 subspecialties of internal medicine, the six subspecialties of pediatrics, and allergy/immunology, dermatology, neurology/child neurology, psychiatry, and child psychiatry. The surgical specialties included general surgery, the nine subspecialties of surgery (including ophthalmology), obstetrics and gynecology, and their subspecialties. The supporting services included anesthesia, pathology, diagnostic and therapeutic radiology and nuclear medicine, rehabilitation medicine, public health/preventive medicine, and emergency medicine. Although the 1983 report[2] had clustered the specialty options into three major categories rather than the four used in the present study, specialty interests of the 1983 and 1987 cohorts can be compared because the identity of each of the 15 individual specialties and specialty groups had been preserved in each cohort.

Racial-ethnic backgrounds were classified in accordance with the AAMC method, which uses the population parity model.[5] Under this system, a minority group is classified as underrepresented if its representation in the physician population is less than its representation in the total population. Conversely, a non-underrepresented minority group in this classification is one whose representation in the physician population is equal to or greater than its representation in the total population. Using the AAMC classification, underrepresented minorities include blacks, Mexican Americans, mainland Puerto Ricans, and Native Americans. Non-underrepresented minorities include Asians, commonwealth Puerto Ricans, and other hispanic groups.

Each student's PSQ and GQ specialty interests were identified, and the students were categorized by gender and ethnic background. Loglinear analysis and simple chi-square techniques, incorporating multiple-comparison adjustment, were used to compare PSQ and GQ specialty interests among students of different racial-ethnic backgrounds.[6,7] Analysis of specialty plans by each individual's ethnic background and gender was not practical in every instance due to the relatively small numbers of students in some of the groups (See Table 1.)

In addition to comparing PSQ and GQ specialty interests of underrepresented minority students with those of all other students, as reported by the AAMC, the following comparisons were made: PSQ and GQ interests of black students with other underrepresented minority students, black students with white students, Asian students with other non-underrepresented minority students, and Asian students with white students.[4] These additional comparisons were undertaken in an effort to identify racial-ethnic-related patterns of change of specialty preference that might have been obscured had only one set of comparisons been analyzed.

Table 2

Numbers and Percentage of 11,136 Students, Classified by Racial-Ethnic Backgrounds and Gender, Who Preferred Given Specialties before Entering Medical School and Chose Given Specialties when Graduating from Medical School*

	Underrepresented Minorities†				Non-Underrepresented Minorities‡							
	Black		Other		Asian		Other		White		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Men before entering medical school												
Primary care	97	38.5	90	59.2	149	35.3	60	26.4	2,659	41.1	3,055	40.6
Medical specialties	21	8.3	11	7.2	55	13.0	37	16.3	741	11.4	865	11.5
Surgical specialties	85	33.7	27	17.8	101	23.9	82	36.1	1,829	28.3	2,124	28.2
Supporting services	20	7.9	12	7.9	37	8.8	29	12.8	471	7.3	569	7.6
Unknown	29	11.5	12	7.9	80	19.0	19	8.4	772	11.9	912	12.1
Total	252	99.9§	152	100	422	100	227	100	6,472	100	7,525	100
Women before entering medical school												
Primary care	84	41.8	34	42.0	103	43.6	36	36.4	1,220	40.7	1,477	40.9
Medical specialties	27	13.4	13	16.0	35	14.8	22	22.2	506	16.9	603	16.7
Surgical specialties	58	28.9	22	27.2	52	22.0	23	23.2	622	20.8	777	21.5
Supporting services	18	9.0	8	10.0	17	7.2	10	10.1	326	10.9	379	10.5
Unknown	14	7.0	4	5.0	29	12.3	8	8.1	320	10.7	375	10.4
Total	201	100.1§	81	100.2§	236	99.9§	99	100	2,994	100	3,611	100 §
Men when graduating from medical school												
Primary care	76	30.2	57	37.5	105	24.9	59	26.0	1,869	28.9	2,166	28.8
Medical specialties	44	17.5	36	23.7	93	22.0	43	18.9	1,237	19.1	1,453	19.3
Surgical specialties	80	31.7	34	22.4	142	33.6	85	37.4	2,026	31.3	2,367	31.5
Supporting services	48	19.0	17	11.2	76	18.0	39	17.2	1,218	18.8	1,398	18.6
Unknown	4	1.6	8	5.3	6	1.4	1	0.4	122	1.9	141	1.9
Total	252	100	152	100.1§	422	99.9§	227	99.9§	6,472	100	7,525	100.1§
Women when graduating from medical school												
Primary care	71	35.3	24	29.6	78	33.1	37	37.4	1,176	39.3	1,386	38.4
Medical specialties	48	23.9	21	25.9	60	25.4	30	30.3	782	26.1	941	26.1
Surgical specialties	50	24.9	21	25.9	58	24.6	16	16.2	587	19.6	732	20.3
Supporting services	29	14.4	11	13.6	36	15.3	14	14.1	408	13.6	498	13.8
Unknown	3	1.5	4	4.9	4	1.7	2	2.0	41	1.4	54	1.5
Total	201	100	81	99.9§	236	100.1§	99	100	2,994	100	3,611	100.1§

*The data for the premedical students' preferences were obtained from their responses to the Premedical Student Questionnaire, administered when they registered for the Medical College Admission Test. The data for the graduating students' choices were obtained from the Medical Student Graduation Questionnaire, completed shortly before graduation.

†Underrepresented minorities are those whose representations in the physician population are less than their representations in the total population.

‡Non-underrepresented minorities are those whose representations in the physician population are equal to or greater than their representations in the total population.

§Percentages do not total 100% because of rounding.

Results

Table 1 summarizes the racial-ethnic backgrounds of the students in the 1987 cohort. Black students constituted approximately two-thirds of the underrepresented minorities group, while Asian students accounted for a similar percentage of the non-underrepresented minorities group. Forty-four percent of the black students and 36% of the Asian students were women. Among the black students, the proportion of women was significantly higher than it was for the entire cohort of U.S. medical school graduates in 1987 ($p < .001$). Among the Asian students the percentage of women was somewhat higher than it was for the entire cohort ($p = .057$).

The top half of Table 2 summarizes the PSQ specialty preferences of the cohort categorized by gender into five racial-ethnic background groups: black, other underrepresented minority, Asian, other non-underrepresented minority, and white students. The bottom half of Table 2 summarizes GQ choices of the same students as seniors in medical school. Log-linear analysis of all data in Table 2 indicates some differences between the specialty choices of the men and the women. Specifically, the women were proportionately more likely than the men to choose medical specialties on

the MCAT ($p < .001$, using parameter estimates from the appropriate log-linear model). As graduates, this tendency continued, with women also choosing primary care more frequently than did men ($p < .001$). The men were proportionately more likely to chose careers in surgical subspecialties and supporting services than were the women ($p < .001$).

There were a relatively small number of specialty preference differences in PSQ responses among those of both genders in some racial-ethnic groups. The black men tended to prefer surgical subspecialties proportionately more frequently than did the men in the other groups ($p < .05$), while the men in other underrepresented minority groups tended to prefer careers in primary care ($p < .001$). The Asian men were less likely to prefer surgical specialties than were the men in the other groups ($p < .01$), while other non-underrepresented minority men were more likely to prefer medical subspecialties or supporting services ($p < .05$), and less likely to prefer primary care ($p < .001$). Finally, the white men were less likely than the men in the other groups to prefer careers in supporting services ($p < .05$). The only significant trend among racial-ethnic groups observed for the women medical students was that a smaller proportion of white women preferred surgical specialties than did the women in the other racial-ethnic groups ($p < .05$).

By the time of the GQ, the differences in choices in terms of racial-ethnic background were less in evidence. Underrepresented minority group men other than black men were now less likely to choose careers in the surgical specialties and supporting services than were men in other racial-ethnic groups ($p < .01$). Non-underrepresented minority men other than Asians chose surgical subspecialties more often ($p < .05$). The white women were more likely to choose primary care at the time of the GQ ($p < .05$).

Within each racial-ethnic group, approximately 20% of the students who chose a specialty as premedical students chose the same specialty as seniors in medical school. Among the 80% of the students who changed their specialty interests during the same period, similar shifts of specialties were observed across racial-ethnic backgrounds. Men and women of almost all racial-ethnic groups indicated a decreased interest in primary care and an increased interest in the medical specialties and supporting services. Between the PSQ and GQ, the surgical specialties increased in popularity among the men; the women's interests in these specialties did not change significantly.

The findings discussed above were also studied using simple chi-square techniques, comparing various combinations of racial-ethnic groups. These further analyses revealed that students of different racial-ethnic backgrounds exhibited generally similar patterns of specialty preferences before entering medical school, and that these patterns became even more similar during the process of undergraduate medical education. At the time of taking the MCAT, underrepresented minority men preferred primary care significantly more frequently than did "all other" men ($p = .017$), while "all other" men preferred the medical specialties more frequently than did underrepresented minority men ($p = .021$). When the students were approaching graduation, however, these discrepancies were no longer evident. Underrepresented minority women preferred the surgical specialties more frequently than did "all other" women on both the PSQ ($p = .004$) and the GQ ($p = .033$).

At the premedical student stage, the black men were significantly less interested in primary care ($p < .001$) and more interested in the surgical specialties ($p < .001$) than were other underrepresented minority men. At the time of the GQ, however, similar proportions of black and other underrepresented minority men were interested in primary care. The black men as seniors, however, continued to be more interested in the surgical specialties than were the other underrepresented minority men ($p = .043$), and the black men had become more interested in specialties within the supporting services than had the other underrepresented minority men ($p = .037$).

There was no significant difference in specialty interests between the black men and the white men, or between the black women and the white women, either at the time of the Premedical Student Questionnaire or at the time of the GQ.

As premedical students, the Asian men were more interested in primary care ($p = .021$) and less interested in the surgical specialties ($p = .001$) than were the other non-underrepresented minority men. These differences were no longer significant at the time of the GQ.

Eighty-five percent of the men and women in the 1987 cohort were white. At the time of the MCAT, white men were more likely than all other men to prefer primary care ($p = .033$), but less likely than all other men to prefer a specialty within the supporting services ($p = .021$). These differences were no longer significant at the time of graduation. At the time of the MCAT, there was no significant difference in the frequencies with which the white women and all other women preferred primary care. As seniors, however, the white women preferred primary care more frequently than did all other women ($p = .016$). All other women preferred the surgical specialties more frequently than did white women, both as premedical students ($p = .017$) and as seniors in medical school ($p = .027$).

The PSQ and GQ specialty interests of the Asian and white students were almost identical. The only statistically significant difference between these groups occurred when, as premedical students, the white men preferred primary care more frequently than did the Asian men ($p < .001$). This difference was no longer significant at the time of the GQ.

Discussion

Cuca[8] studied data from the 1978 GQ in its first year of use on a national scale and reported on specialty choices of seniors classified into the same racial-ethnic background groups as are encompassed by the

current study. She found that 42–56% of the seniors among each of the eight racial-ethnic backgrounds were planning careers within general internal medicine, family practice, or pediatrics (including pediatric subspecialties). Comparing these data with the 1987 cohort of U.S. medical school seniors (Table 2) demonstrates the dramatic decrease in interest in primary care that has occurred within the last decade among senior medical students of all racial-ethnic backgrounds. Furthermore, analysis of minority students' specialty choices from the 1985 GQ[9] reveal the same results as those observed in 1987: there was no statistically significant difference between the specialty choices of underrepresented minority group students and all other students ($p > .05$). Thus, the 1987 observation is not an isolated event. The similarity of GQ choices among students of both black and white backgrounds supports the observation of Adams and Bazzoli[10] that "specialty choices of blacks in total do not differ from those of whites." The findings also support the concept that racial-ethnic background per se does not significantly influence specialty choice among medical school seniors.

In the past, minority students and students from low-income families tended to select specialties within primary care, and to practice in underserved locations.[11] Thus, recruitment of minority groups into medical school not only provided increased professional opportunities for minority students, but also brought these primary care physicians to areas of great medical need. Pinn[12] has expressed the need for more minority students to have access to careers in academic medicine in addition to primary care, not only to serve as role models, but also to enable equitable fulfillment of career aspirations among physicians of minority backgrounds in our society.

In apparent contrast to earlier reports, the present study reveals a congruence of specialty choices among medical students of different ethnic backgrounds. This shift away from an interest in primary care among non-minority as well as minority students could have serious negative implications for health care delivery to minority groups and areas of physician shortage in the United States. It should be emphasized, however, that the end point of this study is neither clinical nor academic practice but the senior year of medical school; the possibility exists that the specialty goals of many minority students ultimately may not be realized. In the 1984 National Residency Matching Program, for instance, only 30% of minority students were matched to their first choice of residency program, and the 14% of minority students who went unmatched that year was more than two and one-half times the national norm.[13] In addition, National Resident Matching Program results in 1985, 1986, and 1987 substantiate Jordan's 1984 findings[14] that a higher proportion of minority students than other students failed to obtain first-year residency positions through the match. It is possible, therefore, that significant numbers of minority students who fail to be matched to the subspecialty of their choice end up in primary care not by desire but by default. Thus, follow-up studies during advanced residency training and beyond are necessary to further monitor the trend away from primary care among senior medical students of all racial-ethnic backgrounds.

This study was supported by the Office of Education Research, the American Medical Association (AMA). The authors express their appreciation to the AMA and to Ms. Judith Frost of the Section for Operational Studies, to Ms. Mary T. Cureton-Russell of the Section for Minority Affairs, both at the AAMC, and to Mr. Nguyen Bach, Department of Medical Biostatistics, University of Vermont, for their assistance in this study.

References

1. Division of Operational Studies. *Student and Applicant Information Management System: General Description.* Washington, D.C.: Association of American Medical Colleges, 1984.
2. Babbott, D., Baldwin, D. C., Jolly, P., and Williams D. J. The Stability of Early Specialty Preferences among U.S. Medical School Graduates in 1983. *JAMA* **259**(1988):1970–1975.
3. Dial, T. H., and Elliott, P. R. Relationship of Scholarships and Indebtedness to Medical Students' Career Plans. *J. Med. Educ.* **62**(1987):316–324.
4. *Medical Student Graduation Questionnaire Subset Report: Underrepresented Minority Respondents versus All students.* Washington, D.C.: Association of American Medical Colleges, 1987.
5. Cureton-Russell, Mary T., ed. *Minority Students in Medical Education: Facts and Figures IV.* Washington, D.C.: Association of American Medical Colleges, 1988.
6. Feinberg, S. E. *The Analysis of Cross-Classified Categorical Data.* 2d ed. Cambridge, Massachusetts: The MIT Press, 1980.
7. Gabriel, K. R. Simultaneous Test Procedures for Multiple Comparisons on Categorical Data. *J. Am. Stat. Assoc.* **61**(1966):1081–1096.
8. Cuca, J. M. 1978 U.S. Medical School Graduates: Career Plans by Racial/Ethnic Identity. *J. Med. Educ.* **55**(1980):721–724.
9. *Medical Student Graduation Questionnaire Subset Report; Underrepresented Minority Respondents versus All Students.* Washington, D.C.: Association of American Medical Colleges, 1985.
10. Adams, E. K., and Bazzoli, G. J. Career Plans of Women and Minority Physicians: Implications for Health Manpower Policy. *J. Am. Med. Wom. Assoc.* **41**(1986):17–20.
11. Bazzoli, G. J., Adams, K., and Thran, S. L. Race and Socioeconomic Status in Medical School Choice and Indebtedness. *J. Med. Educ.* **61**(1986):285–292.
12. Pinn, V. W. The Underrepresented in Graduate Medical Education and Medical Research. *J. Nat. Med. Assoc.* **76**(1984):857–862.
13. Jordan, W. C. Success of Minority Applicants in the National Residency Matching Program. *J. Nat. Med. Assoc.* **78**(1986):737–739.
14. *NRMP Data.* Evanston, Illinois: National Resident Matching Program, 1988.

Early and Final Preferences for Pediatrics as a Specialty: A Study of U.S. Medical School Graduates in 1983

SUSAN E. COFFIN, M.D., and DAVID BABBOTT, M.D.

Abstract—The early and final specialty preferences for pediatrics made by 10,321 U.S. medical school graduates in 1983 were obtained from the students' responses to the Premedical Student Questionnaire, which accompanied their Medical College Admissions Test, and to the Medical Student Graduation Questionnaire, filled out not long before they graduated from medical school. A total of 11.5% of the women and 5.9% of the men expressed a preference for pediatrics on the earlier questionnaire, when they were premedical students; 13.5% of the women and 4.8% of the men actually chose pediatrics when they were senior medical students, as reflected on the later questionnaire. On both questionnaires, 31.3% of the women's preferences and 14.6% of the men's preferences for pediatrics did not change. More than 70% of all the graduating students choosing pediatrics had expressed a premedical preference for a primary care specialty. Fifty-one percent of the women and 42% of the men who abandoned their early preferences for pediatrics chose another specialty within primary care. More students of both genders shifted from a premedical preference for family practice into pediatrics than kept their early preference for pediatrics. If the direction of change noted in this study and others continues, pediatrics will increasingly become a specialty chosen by women. *Acad. Med.* 64(1989)600–605.

The health professions have experienced great changes over the past two decades that have significantly influenced the distribution of physicians among all medical specialties, including pediatrics. The number of students enrolled in U.S. medical schools in 1980 exceeded the number enrolled in 1970 by 81%.[1] Past discussions of physician shortages have been replaced by concerns of an impending (if not current) physician surplus. The percentage of women in medical school has soared from 7.7% in 1964–1965[2] to 32.6% in 1983–1984.[3] Because patterns of specialty choice for women are distinctive from those of men,[4–6] such a major change in the demography of medical trainees could lead to significant alterations in the distribution of medical personnel among the various specialty fields. Finally, increasing numbers of physicians are electing to pursue subspecialty training, leaving many health policymakers concerned that there will soon be a relative shortage of primary care providers.[7–9]

Although the 1980 report of the Graduate Medical Education National Advisory Committee[10] predicted for 1990 a "near-balance" provider-to-need ratio of 115% for pediatrics without oversaturation of its subspecialty fields, other investigators are less confident that these projections are accurate.[11,12] Although many factors affect the current distribution of physicians, some of the most profound influences are seen within the realm of undergraduate medical education.

The present study obtained the specialty preferences among a nationwide cohort of premedical students and compared their preferences with the specialty choices made by the same students as seniors. In so doing, both the stability (that is, nonchange) and change from early preferences were observed. Also, the predictive value of early specialty preferences was sought in order to better identify which students might choose careers as pediatricians and as primary care providers. Special attention was paid to the representation of women in medical school and the interests of medical students in primary care fields.

Method

This study used data from the Association of American Medical Colleges (AAMC) Student and Applicant Information Management System (SAIMS). Specifically, this study drew upon the responses to the Premedical Student Questionnaire (PSQ) and to the Medical Student Graduation Questionnaire (GQ).

The PSQ is administered to all individuals anticipating application to medical school as part of the Medical College Admission Text (MCAT) (most commonly taken one to two years prior to admission). For this reason a response rate approaching 100% is achieved. Included in the questionnaire are items concerning family background, prior work experiences, timing of decision to enter medical school, and anticipated specialty preference from a list of 15 different specialties options, including pediatrics and pediatrics subspecialties.

The GQ is distributed to all senior medical students several months before graduation. Within this questionnaire are items concerning personal and career plans, medical school experiences, and anticipated specialty choice. Individuals are asked to indicate from a list of 50

Dr. Coffin is a resident, Department of Pediatrics, Johns Hopkins Hospital, Baltimore, Maryland; Dr. Babbott is professor, Department of Medicine, University of Vermont College of Medicine, Burlington.

Correspondence should be sent to Dr. Coffin, Department of Pediatrics, Johns Hopkins Hospital, 600 North Wolfe St., Baltimore, MD 21205. Reprints will not be available.

specialties the field in which they plan to seek certification. For students without definite certification plans, "first choice area for certification" and "do not plan to seek certification" options are offered.

This study used information from the two questionnaires that was given by many of the U.S. medical graduates in 1983. A total of 10,321 individuals returned the GQ, a response rate of 65%. This cohort consisted of 7,557 men (73%) and 2,764 women (27%), with a man-to-woman ratio identical to that of the total group of graduating medical students in 1983. Individual specialty choices were obtained from certification plans if stated in the GQ, or from postgraduate-year-1 plans if certification plans were not stated. The specialty choice of each student was then compared with his or her specialty preference as reported in the PSQ. Through cross-tabulation of PSQ and GQ results the stability and change of specialty choice from the students' premedical period to just before graduation were disclosed.

Specialty options in the PSQ and the GQ were classified into three categories: primary care (family practice, pediatrics, pediatrics subspecialties, internal medicine, and internal medicine subspecialties); specialty care (obstetrics and gynecology, surgery, surgical subspecialties, and psychiatry); and supporting services (anesthesiology, pathology, radiology, rehabilitation, emergency medicine, and public health.

This classification of specialties was also used in a previous study of specialty choices of U.S. medical school seniors in 1983.[13a] The rationale for this classification scheme was based on: (1) Final decisions to subspecialize in pediatrics or medicine are not made until mid-residency or later, and (2) many subspecialists provide both specialty and primary care. More recent studies by Babbott et al. (see pages 595–599 in this issue) classify the various specialties into four categories: primary care, medical specialties, surgical specialties, and supporting services. In all these studies, pediatrics and pediatric subspecialties data are summarized separately to enable analysis of each individual specialty.

Due to the GQ's more extensive itemization of subspecialty fields within pediatrics, internal medicine, and surgery, all affirmative responses to any subspecialty within a given area were collapsed into a single "subspecialties" category, thus facilitating comparisons with PSQ results. Included in the PSQ was the option of selecting either family practice or general practice, a distinction that was not made in the GQ, where family practice, but not general practice, was listed as a specialty option. Due to the similarity of clinical work encompassed by these two fields, all PSQ responses indicating an interest in general practice were included in the family practice category. Finally, the PSQ failed to offer emergency medicine as a possible specialty option, a choice that was available on the GQ. When this specialty was selected, it was assigned to the supporting services category.

Table 1

Numbers and Percentages of Women and Men Choosing Specialties before Entering Medical School, U.S. Medical School Graduates, 1983*

Specialty	Women		Men	
	No.	%	No.	%
Primary care				
Family practice†	923	33.4	2,851	37.7
Pediatrics	319	11.5	445	5.9
Pediatric subspecialties	82	3.0	118	1.6
Internal medicine	152	5.5	604	8.0
Internal medicine subspecialties	208	7.5	452	6.0
All primary care	1,684	60.9	4,470	59.2
Specialty care specialties‡	440	15.9	1,589	20.9
Supporting services specialties§	275	9.9	512	6.8
Unknown	365	13.2	989	13.0
All non-primary care	1,080	39.0	3,090	40.7
Total, all specialties	2,764	99.9	7,560	99.9

*Data obtained from responses of 10,321 U.S. medical school graduates in 1983 (65% of all 1983 graduates) to the Premedical Student Questionnaire, given at the time the students took the Medical College Admission Test.

†Includes all responses to the Premedical Student Questionnaire that indicated a preference for general practice.

‡Specialty care specialties were obstetrics and gynecology, surgery, surgical subspecialties, and psychiatry.

§Supporting services specialties were anesthesiology, pathology, radiology, rehabilitation, emergency medicine, and public health.

Results

Table 1 presents the distribution of premedical career preferences in terms of both large specialty groupings and the specialty preferences within primary care. Approximately 60% of both the men and the women were attracted to primary care specialties. Within primary care, men and women showed roughly equal interest in family practice, internal medicine, and internal medicine subspecialties. The women, however, demonstrated a marked preference for pediatrics and pediatrics subspecialties. Their interest in pediatrics fields before medical school entry was almost twice as great as was the men's. Across all specialties, the stability of individual specialty preference (meaning a specialty choice that remained unchanged between the PSQ and GQ) was 20.5%, with similar values for men and women (21.1% and 18.9%, respectively). For women, psychiatry (in the specialty care cate-

Table 2

Numbers and Percentages of Women and Men Whose Choices of a Specialty in Primary Care Remained Unchanged from before Entering Medical School until Graduation, U.S. Medical School Graduates, 1983*

Primary Care Specialty†	Women		Men	
	No.	%	No.	%
Family practice‡	200	21.7	714	25.0
Pediatrics	100	31.3	65	14.6
Pediatric subspecialties	11	13.4	3	2.5
Internal medicine	37	24.3	159	26.3
Internal medicine subspecialties	33	15.9	82	18.1
Overall	381	22.6	1,023	22.9

*Data obtained from responses of 10,321 U.S. medical school graduates in 1983 (65% of all 1983 graduates) to the Premedical Student Questionnaire, given at the time the students took the Medical College Admission Test, and to the Medical Student Graduation Questionnaire, given not long before graduation.

†Obstetrics and gynecology were not classified as primary care specialties in this study.

‡Data for family practice preferences include all responses to the Premedical Student Questionnaire indicating a preference for general practice.

gory) was the most stable preference (36.4% maintained their early preference), while for men an early interest in surgical subspecialties (also in the specialty care category) proved to be the most stable (40.6%)

Table 2 presents the preferences for primary care fields that remained stable. While comparable rates of stability were found for men and women with preferences for family practice, internal medicine, and internal medicine subspecialties, this was not true for the pediatrics fields. When compared with men with the same initial interests, women were twice as stable in their early preferences for pediatrics (31.3% versus 14.6%), and five times more stable in their preferences for pediatrics subspecialties (13.4% versus 2.5%). In addition, the stability rate of 31.3% among women with a premedical interest in pediatrics made this the second most stable of all specialty preferences for women.

Table 3 shows the net flux within each of the primary care fields. That is, primary care as a whole lost 20% of previously interested men and 9% of women during the time in which these students completed their undergraduate medical education. A significant attrition of men from pediatrics and pediatrics subspecialties (19% and 21%, respectively) occurred, although the greatest attrition of both men and women was from family practice, where it exceeded 60%. Women's interest in pediatrics fields, however, was found to increase over the course of medical school, with net gains of 17% in pediatrics and 12% in pediatrics subspecialties.

The left side of Table 4 presents the premedical career preferences of the persons who chose pediatrics at graduation. Here, 274 of 374 women (73.2%) and 296 of 361 men (82.0%) were found to have migrated into pediatrics from a different premedical specialty preference. An early preference for one of the primary care specialties characterized 71.9% of the women and 73.1% of men choosing pediatrics upon completion of medical school. Excluding the 100 women and 65 men with a stable premedical preference for pediatrics, 45.2% of the women and 55.1% of the men choosing to enter pediatrics had been interested in another primary care field before medical school. Family practice was the most common premedical preference of both the women and men choosing to enter pediatrics at graduation. Stable preferences for pediatrics constituted the next largest component of the group of men and women choosing pediatrics. The right side of Table 4 presents the GQ choices of persons with a PSQ preference for pediatrics. Here, 213 of 313 women (68.1%) and 372 of 437 men

Table 3

Numbers of Women and Men Who Chose Primary Care Specialties before Entering Medical School, Numbers of the Same Women and Men Who Chose Each Specialty at Graduation, and Percentages of Change of Choice for Each Specialty, U.S. Medical School Graduates, 1983*

Primary Care Specialty†	Women			Men		
	No. before Entering	No. upon Graduation	% Change	No. before Entering	No. upon Graduation	% Change
Family practice	923	343	−63	2,851	1,121	−61
Pediatrics	319	374	17	445	361	−19
Pediatrics subspecialties	82	92	12	118	93	−21
Internal medicine	152	491	223	604	1,272	111
Internal medicine subspecialties	208	239	15	452	744	65
Overall	1,684	1,539	−9	4,470	3,591	−20

*Data obtained from responses of 10,321 U.S. medical school graduates in 1983 (65% of all 1983 graduates) to the Premedical Student Questionnaire, given at the time the students took the Medical College Admission Test, and to the Medical Student Graduation Questionnaire, given not long before graduation.

†Obstetrics and gynecology were not classified as primary care specialties in this study.

(85.1%) migrated from an initial preference for pediatrics to another specialty. Among persons preferring pediatrics before medical school, 51.1% of the women and 42.1% of the men elected to remain within primary care. Essentially equal proportions of women and men emigrated from pediatrics into other primary care specialties, while a higher proportion of men than women emigrated into specialties within the areas of specialty care and supporting services. Internal medicine and obstetrics and gynecology were the next most common specialty choices of women emigrating from pediatrics. More men were attracted to surgical subspecialties than remained stable in their early preference for pediatrics or emigrated to any other specialty.

Table 4

Patterns of Specialty Choice Migration into and out of Pediatrics, U.S. Medical School Graduates, 1983*

	Students Who Chose a Variety of Specialties before Entering Medical School but Who Chose Pediatrics at Graduation				Students Who Chose Pediatrics before Entering Medical School but Who Chose a Variety of Specialties at Graduation			
	Women		Men		Women		Men	
Specialty	No.	%	No.	%	No.	%	No.	%
Primary care								
Family practice	116	31.0	139	38.5	23	7.3	44	10.1
Pediatrics	100	26.7	65	18.0	100	31.9	65	14.9
Pediatrics subspecialties	18	4.8	14	3.9	16	5.1	13	3.0
Internal medicine	16	4.3	26	7.2	51	16.3	63	14.4
Internal medicine subspecialties	19	5.1	20	5.5	22	7.0	40	9.2
Subtotal	269	71.9	264	73.1	212	67.6	225	51.6
Specialty care								
Obstetrics and gynecology	26	7.0	3	0.8	35	11.2	27	6.2
Surgery	2	0.5	15	4.1	9	2.9	32	7.3
Surgical subspecialteis	6	1.6	10	2.7	14	4.5	78	17.8
Psychiatry	6	1.6	2	0.6	17	5.4	9	2.1
Subtotal	40	10.7	30	8.3	75	24.0	146	33.4
Supporting services								
Anesthesiology	2	0.5	1	0.3	6	1.9	21	4.8
Pathology	10	2.7	8	2.2	3	1.0	12	2.7
Radiology	0	0.0	1	0.3	11	3.5	23	5.3
Rehabilitation	5	1.3	1	0.3	2	0.6	2	0.4
Public health	11	2.9	11	3.0	0	0.0	0	0.0
Emergency medicine†	—	—	—	—	4	1.3	8	1.8
Subtotal	28	7.4	22	6.1	26	8.3	66	15.0
Unknown	37	9.9	45	12.5	0	0.0	0	0.0
Total	374	99.9	361	100.0	313	99.9	437	100.0

*This table shows specialty-specific patterns of migration into and away from pediatrics. Data were obtained from responses of 10,321 U.S. medical school graduates in 1983 (65% of all 1983 graduates) to the Premedical Student Questionnaire, given at the time the students took the Medical College Admission Test, and to the Medical Student Graduation Questionnaire, given not long before graduation.

†Emergency medicine was not offered as a choice on the Premedical Student Questionnaire but was offered on the Medical Student Graduation Questionnaire.

Discussion

This study has confirmed numerous past observations that pediatrics tends to be a "woman-dominated" specialty).[13b-15] Weisman has suggested that a convergence of male and female specialty patterns in medicine has begun over the past 15 years.[16] Although the current study does not address this issue of convergence, analyses of the 1982 and 1986 GQs do not indicate that women's and men's certification plans in pediatrics are converging. In 1982, 12.5% of female and 4.2% of male senior medical students planned to seek certification in pediatrics; by 1986, these percentages had dropped to 11.5% and 3.5%, respectively.[17] With essentially stable medical school enrollments in the United States and a decreasing proportion of medical students who are men, further declines in the specialty choice of pediatrics among men will result in an absolute decrease of male pediatricians. Thus, the discipline could become an increasingly female-dominated specialty. Whether an absolute decrease in the number of practicing female pediatricians will occur can be determined only by the balance of increasing numbers of female medical students with their apparent declining interest in pediatrics as a specialty choice.

Premedical Preferences

The vast majority of premedical students favored specialties within primary care, with approximately 60% of both the men and the women indicating a preference for one of these five fields. Early popularity of primary care fields was also demonstrated in Bergquist's study[3] of 180 freshman medical students at the Medical College of Wisconsin. He, however, observed a marked female predominance in this preference, with 70.4% of the female students surveyed indicating an interest in a primary care field as opposed to only 44.4% of the man (Further analysis of the data in the present study revealed only small gender differences in premedical preferences for family practice, internal medicine, and its subspecialties, while, as noted earlier, pediatrics and its subspecialties attracted approximately twice as much interest proportionally among women than

among men. These data correlated well with those of Gruppen and Brown,[5] who found essentially no gender differences in interests in family practice and internal medicine among 482 University of Michigan freshman medical students, whereas pediatrics appealed to 13% of the women as compared with only 7% of the men.

Stability of Premedical Preferences

The overall 20.5% rate of stability of early specialty preference that this study disclosed was substantially below comparable data generated by other studies evaluating the stability of career choice over the course of undergraduate medical education,[18-22] where stability rates as high as 55% have been reported. The 55% reported by Wasserman and colleagues,[18] however, was generated by a survey of only 106 medical students during their freshman and senior years.

In the present study, the rate of stability of initial choices for pediatrics made by women was more than twice that of the men who made such initial choices. This pattern of men migrating from an early preference of pediatrics has also been documented in studies by Zimet and Held[23] and Geertsma and Grinols,[19] where an initial interest in pediatrics among men was found to be the overall least stable specialty preference, while the choices for pediatrics among women were much more stable. The present study, however, discovered that the men's initial preferences for public health, pathology, and pediatrics subspecialties were even less stable than were their preferences for pediatrics, although the relatively small numbers of men abandoning pediatrics subspecialties and pathology preclude definitive interpretation.

Migration into Pediatrics

A preference for primary care characterized over 70% of the men and women who planned to enter pediatrics upon the completion of undergraduate medical education. Approximately 50% of the men and women who migrated into pediatrics during the course of medical school had indicated a preference for another primary care field on the PSQ. In a review of seven studies conducted from 1967 to 1982, Markert noted that less than one-third of the students choosing pediatrics at graduation had migrated from another primary care specialty.[24] Among both men and women choosing pediatrics, family practice had been the earlier specialty preference that was most frequently cited, followed by a stable preference for pediatrics. The women without a specialty preference when they completed the PSQ chose pediatrics more than twice as often as did the undecided men who were their counterparts. This finding suggests that the observed predominance of women choosing pediatrics is indeed related to gender rather than to the timing of the decision.

Migration out of Pediatrics

This study demonstrated distinct gender-related differences in the ultimate specialty choices of women and men with an early but unstable preference for pediatrics. While more than two-thirds of the women (70.4%) with a premedical preference for pediatrics chose to remain within the primary care area, less than half of the men who were their counterparts (46.3%) elected to do so.

This pattern of men migrating into surgical subspecialties in particular and specialty care and supporting services in general was also observed by Gruppen and Brown.[5] Following surgical subspecialties, internal medicine was the next most common specialty choice of men migrating from pediatrics. Among the women, internal medicine, followed by obstetrics and gynecology, attracted the largest numbers of individuals who changed their early preference for pediatrics, a pattern noted by Markert[26] in his review of seven studies of specialty selection.

Summary

At the time of this study, pediatrics continued to be a woman-dominated specialty, with greater interest from women before medical school entry, greater stability of early preference, and a net increase in the number of female students intending to enter pediatrics at graduation. Estimates, however, of both the number and gender of U.S. pediatricians in the future are difficult to make. With the decreasing percentage of medical students who are men and their declining interest in pediatrics, it is likely that pediatrics will become an increasingly female-dominated specialty. Nonetheless, it is difficult to predict the future contribution of women to the field of pediatrics. Concomitant increases in the number of women who are medical students appear to be somewhat offset by their apparent decreasing interest in pediatrics, and make predictions of the future percentage of women in this specialty difficult.

Finally, strong correlations were shown between an interest in pediatrics and a dedication to primary care. Fifty-one percent of the women and 42% of the men choosing to leave pediatrics entered other primary care fields. Forty-five percent of the women and 55% of the men migrating to pediatrics had indicated an early interest in another primary care field. In this time of increased concern over a dwindling commitment to primary care among medical students, an interest in pediatrics expressed before medical school begins might identify the students who would be most likely to enter primary care fields.

This study was supported by a grant from the Office of Education Research of the American Medical Association.

References

1. Medical Education in the United States, 1979-1980. *JAMA* **244**(1980):2801-2813.
2. Dube, W. F. Women Students in U.S. Medical Schools: Past and Present Trends. *J. Med. Educ.* **48**(1973):186-189.
3. Bergquist, S. R. et al. Perceptions of Freshman Medical Students of Gender Differences in Medical Specialty Choice. *J. Med. Educ.* **60**(1985):379-383.
4. Cuca, J. M. The Specialization and Career Preferences of Women and Men Recently Graduated from U.S. Medical Schools. *J.*

Am. Med. Wom. Assoc. **34**(1979):425–435.
5. Gruppen, L. D., and Brown, D. R. Longitudinal Changes in Specialty Preferences: Sex Differences. In *Research in Medical Education: 1981. Proceedings of the Twentieth Annual Conference*, K. G. Fritz, compiler, pp. 100–105. Washington, D.C.: Association of American Medical Colleges, 1981.
6. Weisman, C. S., Levine, D. M., Steinwachs, D. M., and Chase, G. A. Male and Female Physician Career Patterns: Specialty Choices and Graduate Training. *J. Med. Educ.* **55**(1980):813–825.
7. Roddy, P. C. Need-Based Requirements for Primary Care Physicians. *JAMA* **243**(1980):355–358.
8. Relman, A. S. Who Will Train All Those Primary Care Physicians? *N. Engl. J. Med.* **299**(1978):652–654.
9. Scheffler, R. M., Weisfeld, N., Ruby, G., and Estes, E. H. A Manpower Policy for Primary Health Care. *N. Engl. J. Med.* **298**(1978):1058–1062.
10. *Summary Report of the Graduate Medical Education National Advisory Committee.* U.S. Department of Health and Human Services, DHHS Publication No. (HRA)81-651. Washington, D.C.: Government Printing Office, 1980.
11. Budetti, P. P. The Impending Pediatric "Surplus": Causes, Implications, and Alternatives. *Pediatrics* **67**(1981):597–606.
12. American Academy of Pediatrics. *Critique National Advisory Committee. Pediatrics* **67**(1981):585–596.
13a. Babbott, D., Baldwin, D.C., Jolly, P., and Williams D. J. The Stability of Early Specialty Preferences among U.S. Medical School Graduates in 1983. *JAMA* **259**(1988)1970–1975.
13b. Cuca, Janet Mele. *Career Choices of the 1976 Graduates of U.S. Medical Schools.* Washington, D.C.: Association of American Medical Colleges, 1977.
14. Langwell, K. M. Differences by Sex in Economic Returns Associated with Physician Specialization. *J. Health Politics, Policy and Law* **6**(1982):752–761.
15. Katz, L., Sarnacki, R. E., and Schimpfhauser, F. The Role of Negative Factors in Changes in Career Selection by Medical Students. *J. Med. Educ.* **59**(1984):285–290.
16. Weisman, C. S. Gender Composition of Medical Schools and Specialty Choices of Graduates. *J. Med. Educ.* **54**(1984):347–349.
17. *Medical Student Graduation Questionnaire Survey Results: Summary Reports.* Washington, D.C.: Association of American Medical Colleges. [The reports consulted were from 1982 through 1986; they are not generally available in libraries but can be obtained through the student affairs offices of many medical schools.]
18. Wasserman, E., Yufit, R. I., and Pollack, G. H. Medical Specialty Choice and Personality: Outcome and Postgraduate Follow-Up Results. *Arch. Gen. Psychiatry* **21**(1969):529–535.
19. Geertsman, R. H. and Grinols, D. R. Specialty Choice in Medicine. *J. Med. Educ.* **47**(1972):509–517.
20. Held, M. L., and Zimet, O. N. A Longitudinal Study of Medical Specialty Choice and Certainty Level. *J. Med. Educ.* **50**(1975):1044–1051.
21. Markert, R. J. *Stability and Change of Medical Specialty Choice.* Program Evaluation Studies Report, no. 7. Dayton, Ohio: Wright State University School of Medicine, 1982.
22. Burkett, G., and Kruz, D. A. A Comparison of the Professional Values and Career Orientations of Male and Female Medical Students: Some Unintended Consequences of U.S. Public Policy. *Health Policy Educ.* **2**(1981):33–45.
23. Zimet, O. N., and Held, M. L. The Development of Views of Specialties during Four Years of Medical School. *J. Med. Educ.* **50**(1975):157–166.
24. Markert, R. J. Change in Specialty Choice during Medical School. *J. Fam. Pract.* **17**(1983):295–300.

Characteristics of Medical Schools Related to the Choice of Family Medicine as a Specialty

DOUG CAMPOS-OUTCALT, M.D., and JANET H. SENF, Ph.D.

Abstract—Previous research has identified five characteristics of medical schools that are related to the choice of family medicine as a specialty: (1) the amount of time devoted to required training in family medicine, (2) the timing of the required family medicine training, (3) the type of ownership of the school (public or private), (4) the geographic location of the school, and (5) the administrative structure of family medicine within the school. These five characteristics of U.S. medical schools during the mid-1980s, together with the school tuition levels, were examined with both univariate and multivariate analysis to observe their relationships to the percentage of U.S. medical graduates entering family medicine between July 1986 and December 1987. With univariate analysis, each characteristic was significantly related to the percentage of graduates entering family medicine. Using multivariate analysis, only the number of weeks required and the type of ownership of the school were significantly related to the percentage of graduates entering family medicine, with the higher percentages related to greater numbers of required weeks of family medicine training and to public ownership of the school. *Acad. Med.* 64(1989):610–615.

During the 1970s, the specialty of family practice grew rapidly. In part, this resulted from federal and state financial incentives. There were 1,016 family practice positions offered in the National Resident Matching Program (NRMP) in 1974, and 2,340 in 1980.[1] These residency programs were popular with graduates of U.S. medical schools, with over 70% of the positions being filled each year. Family practice residents during those years had higher MCAT scores and scored higher on scales of idealism than did their peers who chose other specialties.[2]

The past decade has been one of consolidation and slow growth. Table 1 shows the NRMP results from 1980 to 1988. The number of residency positions offered has increased by only 72; the percentage of positions filled by U.S. medical school graduates has remained above 70 in every year except 1985 and 1988. The number of positions filled by North American graduates other than U.S. medical school graduates has more than tripled, while the low representation of foreign medical graduates has not changed. Family practice residents in the early 1980s earned undergraduate grades and MCAT scores equal to the scores of those who chose other specialties during that time.[3]

The match results of 1988 were a matter of concern to many family practice educators. The number of U.S. graduates who were matched in family practice was markedly lower than in previous years, as was the overall rate of positions filled. The results for 1989 are being analyzed to determine whether what occurred in 1988 was an exception or the beginning of a trend. There is some evidence that medical students are becoming less interested in primary care careers, although up to 1988 most of this decline in numbers had been due to a decreasing number of graduates choosing general internal medicine.[4]

If family medicine is to remain attractive to present and future medical students, educators in the field must understand the motivation of students and the factors that affect their specialty selection. While studies of students in earlier eras may not apply to today's students, they can indicate possible directions for research.

The purpose of this study has been to use recent data from all U.S. medical schools to assess the interrelationships among tuition levels and the other factors found by previous studies to be associated with students' choice of family practice.

Dr. Campos-Outcalt is assistant professor, and Dr. Senf is research assistant professor, Department of Family and Community Medicine, University of Arizona College of Medicine, Tucson.

Correspondence and requests for reprints should be addressed to Dr. Campos-Outcalt, Department of Family and Community Medicine, College of Medicine, University of Arizona, Tucson, AZ 85724.

The Previous Studies

Markert has summarized 12 studies conducted between 1967 and 1982 that show a dramatic decrease in students' preferences for family practice between the first and last years of medical school.[5] Up to 75% of students choose a specialty during the third or fourth year.[6] Special family medicine tracks, involving a continuous emphasis on family practice throughout medical school, increase the percentage of students choosing the specialty,[7,8] and there is some evidence that clerkships affect specialty choice.[9] Because medical students often obtain negative images of family medicine from other specialists, it has been proposed that early exposure to family practice role models is necessary to offset this influence.[10] Studies have not consistently shown that early exposure actually makes a difference.[6,11]

Medical schools with stronger departments of family medicine graduate higher percentages of students going into family practice.[12,13] Students who attend schools with a required third-year clerkship in family practice are more likely to enter the specialty than are students from schools with a required fourth-year clerkship; schools with no required family practice clerkship produce lower percentages of students entering family medicine, although 77% of all students choosing a family prac-

Table 1

Numbers of Positions Offered in U.S. Family Practice Residencies and Numbers and Percentages of the Positions Filled, 1980–1988*

Year	No. Positions Offered	Positions Filled by U.S. Graduates No.	%	Positions Filled by Other U.S. and Canadian Graduates† No.	%	Positions Filled by Foreign Medical Graduates No.	%	Total % Filled
1980	2,340	1,703	73	70	3	45	2	78
1981	2,370	1,727	72	60	3	71	3	78
1982	2,362	1,757	74	74	3	109	5	82
1983	2,353	1,681	71	173	7	42	2	81
1984	2,359	1,773	75	195	8	43	2	85
1985	2,372	1,626	69	232	10	40	2	80
1986	2,390	1,680	70	245	10	35	1	82
1987	2,395	1,728	72	216	9	35	1	83
1988	2,412	1,494	62	230	9	43	2	73

*The information for this table comes from the yearly summaries of National Resident Matching Program results published in *Academic Medicine*.

†These graduates are from U.S osteopathic schools and Canadian medical schools; physician candidates (that is, earlier U.S. graduates seeking positions in graduate medical education); "fifth pathway" students (that is, U.S. nationals who completed course requirements for a medical degree abroad followed by a year of clinical training in a U.S. hospital under medical school sponsorship); and U.S. foreign medical graduates.

tice residency come from such schools.[9] The geographic location of a medical school also appears to have some influence on specialty choice, although this has not been studied in conjunction with all the other factors mentioned.[13]

Rising tuition levels are particularly worrisome because the resulting educational debt may affect specialty choice; a 37% increase in debt level between 1981 and 1986 paralleled a drop in interest in primary care.[4] Another indication of a potential link is the study by Rabinowitz[9] that showed that among the variables of class size, school age, type of school ownership, and clerkship status, the type of ownership of the medical school (public or private) was the most important variable predicting the percentage of graduates choosing family practice. He did not, however, look at tuition level as a factor separate from ownership. Two studies early in this decade did not document an effect of debt on specialty choice[14,15]; one later study did find some relationship, with students having higher debt levels choosing subspecialties more often.[16]

Method

The dependent variable studied was the percentage of students graduating from each U.S. medical school during a one-year period between July 1986 and June 1987 who were family practice residents in December 1987.[17] Puerto Rican schools were not studied. During this period there were 15,872 graduates, and 1,911 (12%) were residents in family practice programs in December 1987. The independent variables studied were the following school characteristics: (1) total annual tuition and fees; (2) number of weeks of required clinical training in family practice in post–basic science years; (3) timing of the required family practice training; (4) geographic location; (5) type of ownership (private or public); and (6) administrative structure of family practice within the school.

Information about tuition and fees was obtained from the AAMC handbooks on admission requirements for the years 1984–85 and 1986–87.[18,19] These years were chosen to provide two sources of tuition data for years when all the graduates being studied were attending medical school, regardless of the length of the curriculum. The dollar amounts used in this study for resident tuition and fees for the individual schools were calculated by averaging the amounts listed in the two editions of the handbook. The number of weeks and the timing of required clinical training in family practice were obtained from the *1986–87 AAMC Curriculum Directory*.[20]

To be included, curriculum time had to be listed as being in family practice, family medicine, or family and community medicine and had to be taken after the completion of the basic science training (the equivalent of being in the third or fourth year of a standard four-year curriculum). Courses listed as ambulatory care, community medicine, or preventive medicine were not included, nor were elective courses. The course was listed as being required before the fourth year if it was situated in year three of a four-year curriculum, year two in a three-year curriculum, or year five in a six-year curriculum. It was listed as not being required before the fourth year if (1) it was listed as required in year four of a four-year curriculum, in year three of a three-year curriculum, or year six in a six-year curriculum, or, (2) it was required but could be taken in either the last or the next-to-last year. A family practice course that was required in both years was listed as being required before the fourth year. Family practice courses required concurrent with basic science courses were not counted. No attempt was

Table 2

Percentages of 1986 and 1987 U.S. Medical School Graduates Entering Family Medicine and Numbers of Schools by Categories of Selected Medical School Characteristics*

Characteristic	% Entering	No. Schools	F	p
Average tuition and fees per year				
Less than $2,790	14.9	31		
$2,790 thru $4,999	16.0	31		
$5,000 thru $9,999	13.6	29		
$10,000 or more	6.9	32		
			9.5	<.001
Weeks of requred family medicine				
None	10.0	77		
Less than six	14.4	25		
Six	19.3	10		
Eight	23.0	11		
			15.1	<.001
Required experience before fourth year				
Not required	10.0	77		
Not required before fourth year	16.8	18		
Required before fourth year	18.0	28		
			15.4	<.001
Region				
New England	7.2	9		
Middle Atlantic	8.1	21		
East North Central	14.5	19		
North West Central	15.0	12		
South Atlantic	12.5	24		
East South Central	15.2	9		
West South Central	16.0	13		
Mountain	16.0	5		
Pacific	14.7	11		
			2.3	<.05
Ownership				
Private	9.1	51		
Public	15.5	72		
			21.6	<.001
Structure of family medicine within school				
Department	14.6	97		
Division/section	8.5	9		
None	4.6	17		
			15.5	<.001

*The data on students are for all those who graduated from 123 U.S. medical schools between July 1986 and June 1987 who were family practice residents by December 1987. The school characteristics had been identified by earlier studies as being significantly related to the choice of family medicine as a specialty. The data on the characteristics used in this study were obtained from the Association of American Medical Colleges directories of admissions requirements for 1984–85 and 1986–87.

made to separate clerkships from preceptorships.

Each school was classified in one of nine geographic areas comparable to those used by Goldsmith.[13] The type of ownership of each school (public or private) was obtained from the 1988 medical education issue of the *Journal of the American Medical Association*.[21] The administrative structure of family practice was described by the American Academy of Family Physicians[22] and was listed as department, division/section, or none.

The initial analysis looked at the univariate relationship of each independent variable to the percentage of graduates who entered family medicine. The second analysis was multivariate, including all of the independent measures in an analysis of variance.

Results

All 123 U.S. medical schools were included in the study; 72 were public and 51 private. There were 97 departments of family practice, nine divisions of family practice, and 17 schools (all private) with no formal family practice structure. Forty-six schools required family practice to be taken in the post–basic science years, and 28 required it prior to the last year; 21 schools required six or more weeks of study. Twenty-eight percent of the private schools and 44% of the public schools had a family practice requirement.

The initial analysis of variance showed that each of the measures identified by previous studies was significantly related to the percentage of graduates entering family medicine, in the direction expected when a single variable, tuition level, which had not been studied before, had a relationship consistent with the hypothesis that increased tuition, and presumably increased debt, is related to lower percentages of graduates entering family medicine, although this relationship was most striking when tuitions were above $10,000. Table 2 shows the relationship for each measure to the percentage of graduates entering family medicine.

Two of the variables, required weeks and required experience before the fourth year, were so strongly related to one another that they were combined in a single variable for the multivariate analysis. This variable had five categories: none required, less than six weeks required but not before the fourth year, less than six weeks required before the fourth year, six weeks or more required but not before the fourth year, and six weeks or more required before the fourth year. Other variables were also strongly related to one another. Two of the most striking instances of this were that (1) none of the schools with

Table 3

Unadjusted Percentages and Adjusted Percentages (by Analysis of Variance) of 1986 and 1987 U.S. Medical School Graduates Entering Family Medicine, and Numbers of Schools, All by Categories of Selected Medical School Characteristics*

Characteristic	Entering Unadjusted %	Simple Beta	Entering Adjusted† %	Partial beta	No. Schools	*F*	*p*
Average tuition and fees per year							
Less than $2,790	14.9		9.8		31		
$2,790 through $4,999	16.0		12.2		31		
$5,000 through $9,999	13.6		14.6		29		
$10,000 or more	6.9		14.7		32		
		.44		.25		1.2	.30
Weeks of required family medicine and timing of requirement							
None	10.0		10.6		77		
Less than six/not before fourth	13.6		12.2		13		
Less than six/before fourth	15.3		13.9		12		
Six or more/not before fourth	25.2		24.8		5		
Six or more/before fourth	20.0		19.7		16		
		.53		.45		9.2	<.001
Region							
New England	7.2		9.7		9		
Middle Atlantic	8.1		10.5		21		
East North Central	14.5		13.5		19		
North West Central	15.0		13.5		12		
South Atlantic	12.5		12.1		24		
East South Central	15.2		12.0		9		
West South Central	16.0		16.2		13		
Mountain	16.0		12.0		5		
Pacific	14.7		16.4		11		
		.37		.26		1.2	.29
Ownership							
Private	9.1		9.2		51		
Public	15.5		15.4		72		
		.39		.38		6.4	.01
Structure of family medicine							
Department	14.6		13.5		97		
Division/section	8.5		11.3		9		
None	4.6		9.7		17		
		.45		.17		1.6	.20

*The data on students are for all those who graduated from 123 U.S. medical schools between July 1986 and June 1987 who were family practice residents by December 1987. The school characteristics had been identified by earlier studies as being significantly related to the choice of family medicine as a specialty. The data on the characteristics used in this study were obtained from the Association of American Medical Colleges directories of admissions requirements for 1984–85 and 1986–87.

†This column is the percentage of graduates entering family medicine adjusted for the effect of all the other variables in the table.

a division/section or with no formal structure had required time in family medicine in the third or fourth year, whereas 47% of the schools with a department did have required time; and (2) Tuition level was related to ownership of the school, with only a few private schools in the lower half of the tuition range and only a few public schools in the upper half.

The results of the initial analysis of variance are presented in Table 3. The second column is the percentage of graduates entering family medicine, adjusted for all the other variables in the table. The significance level reported is for the adjusted percentages. To the right are the numbers representing the simple and partial betas from the regression analysis, which for each variable decline as controls are introduced. Clearly these variables share much of the variation in the percentage of stu-

dents entering family medicine; only the amount and timing of required family practice training and ownership of school are significant when the other variables are used for controls. Overall, the variables account for almost half of the variability in the percentage of students entering family medicine. The multiple R (that is, the multiple correlation between percentage entering family medicine and all the independent variables) is .69, and R^2 (that is, the amount of variation in the percentage entering family medicine explained by the independent variables) is .48.

The final analysis of variance included only the amount of required time and ownership of the school. The combination variable (that is, the number of required weeks and timing) was dropped in favor of number of required weeks alone, since the difference between before the fourth year or not before the fourth year was not significant when number of weeks was controlled. While there was some loss of prediction in removing the additional variables, the two remaining still produce a multiple R of .62 and an R^2 of .38. The adjusted percentage of students entering family medicine rose from 10.4% for schools with no required time to 22.2% for schools with eight weeks of required time ($F = 19.5$, $p < .001$). Private schools had an average of 9.7% entering family medicine compared with 15.0% for public schools (adjusted percentage, $F = 19.5$, $p < .001$).

Discussion

Each of the six variables studied was associated in the expected direction with the proportion of graduates choosing family practice. However, when controlling for all other variables, only two, public versus private ownership of the school and the number of weeks of required family practice curriculum time, were significant.

Contrary to the hypothesis, a school's level of tuition and fees was not related to the choice of family practice as a specialty when other variables were considered simultaneously. Even though it seems logical that increased levels of debt might lead students to choose more lucrative specialties, this may be counterbalanced by the fact that less lucrative specialties such as family practice require less post-graduate training and allow debt repayment to start sooner. Tuition level, of course, may not be a good proxy for student debt. This subject deserves further study.

The results indicate that the number of weeks of required family practice curriculum time is important, more so than is the timing of the requirement. This finding is surprising, given what is known about the timing of choice of specialty and the presumed importance of previous experience in family medicine in influencing students to choose this field. It is possible that required time reflects total time studying family practice, and as total time increases, it would tend to be distributed across all years of study, making the earlyness or lateness of the required time less important. This finding also needs to be explored further.

Several studies have shown that the number of medical students who state a preference for family practice upon matriculation is much larger than the number eventually entering a family practice residency. While some students who state a preference for family practice are not affected by their experiences in other clerkships,[14] others do change their specialty preferences based on negative impressions of family medicine gained during medical school.[23] It would appear that the greater the exposure to family medicine, the more likely it is that students will find the field appealing. It may also be that stronger family practice departments have better role models and at the same time are more successful at obtaining larger amounts of required curriculum time. Exposure per se need not be a positive influence; students could be influenced negatively by a poor educational experience.

The important relationship between school ownership (public versus private) and the proportion of graduates choosing family practice has been documented elsewhere.[9] Our hypothesis that this relationship might be due to tuition levels was not correct. While it is true that private schools have higher tuition, less influential family practice representation, and less required family practice curriculum time, these characteristics do not explain the smaller percentage of graduates choosing family practice. It is possible that public schools, being more dependent on public funds, are under more pressure to produce primary care physicians. This may result in a different emphasis during the selection of applicants for admission. It is also possible that students who choose private schools may be less inclined towards primary care.

This study involves students who graduated in a one-year span of time, its generalizability to other years remains to be determined. The results do, however, suggest that there is a strong relationship between amount of exposure to family medicine and the percentage of students choosing family medicine as a specialty. Since this study was cross-sectional in design, further research is needed to determine whether increasing the curricular time for family medicine would lead to an increase in the percentage of students choosing family medicine.

References

1. Goldsmith, G. Medical Student Interest in Family Practice: How is it Changing? *Fam. Med.* **14**(1982):13–16.
2. Collins, F., and Roessler, R. Intellectual and Attitudinal Characteristics of Medical Students Selecting Family Practice. *J. Fam. Pract.* **2**(1975):431–432.
3. Burkett, G. L., and Gelula, M. H. Characteristics of Students Preferring Family Practice/Primary Care Careers. *J. Fam. Pract.* **3**(1982):505–512.
4. Tudor, C. Career Plans and Debt Levels of Graduating U.S. Medical Students, 1981–1986. *J. Med. Educ.* **63**(1988):271–275.
5. Markert, R. J. Change in Specialty Choice during Medical School. *J. Fam. Pract.* **2**(1983):295–300.
6. Brearley, W. D., Simpson, W., and Baker, R. M. Family Practice as a Specialty Choice: Effect of Premedical and Medical Education. *J. Med. Educ.* **57**(1982): 449–454.
7. Phillips, T. J., Gordon, M. J., Leversee, J. H., and Smith, K. Family Physician Pathway and Medical Student Career Choice. *JAMA* **240**(1978):1736–1741.

8. Harris, D. L., Coleman, M., and Mallea, M. Impact of Participation in a Family Practice Track Program on Student Career Decisions. *J. Med. Educ.* **57**(1982):609–614.
9. Rabinowitz, H. K. The Relationship between Medical Student Career Choice and a Required Third-Year Family Practice Clerkship. *Fam. Med.* **20**(1988):118–121.
10. Stephens, G. G. Choosing Family Practice? Report of a Medical Student Survey Class of '81. *Ala. J. Med. Sci.* **19**(1982):76–80.
11. Allen, S. S., Sherman, M. B., Bland, C. J., and Fiola, J. A. Effect of Early Exposure to Family Medicine on Students' Attitudes Toward the Specialty. *J. Med. Educ.* **62**(1987):911–917.
12. Beck, J. D., Stewart, W. C., Graham, R., and Stern, T. L. The Effect of the Organization and Status of Family Practice Undergraduate Programs on Residency Selection. *J. Fam. Pract.* **4**(1977):663–669.
13. Goldsmith, G. Factors Influencing Family Practice Residency Selection: A National Survey. *J. Fam. Pract.* **15**(1982):121–124.
14. Paiva, R. E. A., Vu, N. V., and Verhulst, S. J. The Effect of Clinical Experiences in Medical School on Specialty Choice Decisions. J. Med. Educ. **57**(1982):666–674.
15. French, F. D. The Financial Indebtedness of Medical School Graduates. *N. Engl. J. Med.* **304**(1981):563–565.
16. Geertsma, R. H., and Romano, J. Relationship Between Expected Indebtedness and Career Choices of Medical Students. *J. Med. Educ.* **65**(1986):555–559.
17. Schmittling, G. Entry of U.S. Medical School Graduates into Family Practice Residencies, 1987–1988. *Fam. Med.* **20**(1988):364–367.
18. Wilson, Vickie, ed. *Medical School Admission Requirements, 1984–85: United States and Canada.* Washington, D.C.: Association of American Medical Colleges, 1984.
19. Wilson, Vickie, ed. *Medical School Admissions Requirements, 1986–1987: United States and Canada.* Washington, D.C.: Association of American Medical Colleges, 1986.
20. Association of American Medical Colleges. *1986–87 AAMC Curriculum Directory.* Washington, D.C.: AAMC, 1986.
21. Medical Schools in the United States. *JAMA* **260**(1988):1131–1135.
22. American Academy of Family Physicians. *Activity in Family Medicine at 138 U.S. Medical Schools and Branches.* Reprint 164. Kansas City, Missouri: AAFP, 1989.
23. Katz, L. A., Sarnacki, R. E., and Schimpfhauser, F. The Role of Negative Factors in Changes in Career Selection by Medical Students. *J. Med. Educ.* **59**(1984): 285–290.

Initial Career Choices of Medical School Honors Graduates in the Early 1970s and 1980s

WILLIAM E. GOLDEN, M.D.

Abstract—To investigate the changes over time in the attractiveness of a number of medical specialties as careers, the author analyzed the initial career pathways of students who graduated with honors in 1972, 1973, 1982, and 1983 from nine of the most prestigious American medical schools. The data were analyzed to discern career selection differences among the total population studied, between the men and women, and between the graduates of public and private institutions. Internal medicine showed statistically significant declines in its attractiveness to the students in all the categories but remained overrepresented as a career choice by honors students compared with its attractiveness to medical students in general for the years studied. Radiology was chosen by an increasing percentage of the honors students in the 1980s, but mostly by students from private medical schools. The men who were honors graduates in the 1980s chose surgery fields more often, while women honors graduates tended to enter pediatrics and obstetrics-gynecology. These data indicate that the career choices of honors graduates in the early 1980s more closely mirrored the career choices of all students entering medical specialty fields and do not reveal gross imbalances. Of the primary care disciplines, only internal medicine attracted fewer honors graduates in the 1980s. *Acad. Med.* 64(1989): 616–621.

Recent difficulties of prominent internal medicine residency programs in filling their housestaff programs have led some medical educators to decry the shift away from internal medicine training.[1,2] Others have stated that the data to demonstrate shifts in career selection to procedural fields by graduating students do not exist. Nevertheless, the total number of applicants to internal medicine programs has declined.[3]

Shifts in career attractiveness may occur years before they are easily discernible in large shifts in demographic data. The effects of reimbursement trends, factors relating to practice, and the underlying science of a discipline can contribute to changes in specialty selection. Since specialty selections can begin in the college years, years may pass before changes in students' perceptions of desirable medical specialties are seen when students make their final selection of residency positions. Furthermore, gross statistics on the rates at which students are matched with first-year residencies can obscure career selection information, because some students may not match in a specialty of choice, and because many first-year programs are intended only as a preliminary year before other specialty training.

Students who graduate with honors at prestigious medical schools are the most likely to have the widest array of unimpeded career options. For this reason, their choices can reflect the relative attractiveness of careers in the various specialties. This paper examines the changes in career choices of honors students from highly ranked medical schools from the early 1970s and the early 1980s to determine whether there has been a shift in career selection by the best and the brightest students in the medical education system.

Method

All students who graduated with honors or as members of Alpha Omega Alpha (AOA), the medical school honor society, during the years 1972, 1973, 1982, and 1983 from 11 prestigious medical schools were eligible to be subjects of this study. The students from the selected years were identified by records obtained from AOA, graduation programs, and the schools' offices of student affairs.

The schools were selected because each was ranked among the top 12 medical schools by each of two independent evaluations.[4,5] Of the 11 schools selected for inclusion in this study, two were unable to supply data pertaining to AOA or honors graduates for students in the early 1970s. The remaining nine schools (Columbia, Cornell, Duke, Johns Hopkins, University of Michigan, University of Pennsylvania, University of California at Los Angeles, University of California at San Francisco, and Yale) supplied 676 names (293 from 1972 and 1973, and 383 from 1982 and 1983). The increase in honors graduates between the two periods slightly exceeded the increase in enrollments of the schools in this sample (13% versus 15% of graduates). The data on the students' career choices were retrieved from one of two records: the Directory of Medical Specialists[6] or the American Medical Association Masterfile.

This study sought information on the initial career choices of the students at the completion of medical school. Those trainees who changed disciplines prior to obtaining board certification in a specialty were categorized by their fields of first intention. Specialty changes consistent with traditional training pathways were categorized according to those

Dr. Golden is director, Division of General Internal Medicine, University of Arkansas for Medical Sciences, Little Rock.

Correspondence and requests for reprints should be addressed to Dr. Golden, Division of General Internal Medicine, University of Arkansas for Medical Sciences, 4301 W. Markham, Slot 641, Little Rock, AR 72205.

pathways. Thus, an individual who spent one year as a surgical intern and then went into pathology was counted as a general surgeon, but one who spent two years in general surgery before starting a urology residency was counted as a urologist. Similarly, a trainee who completed one year of internal medicine before going into dermatology was counted as a dermatologist, but the trainee was counted as an internist if he or she completed two years of internal medicine prior to entering a dermatology residency. Virtually all were evaluated in this manner except for a few individuals for whom complete records were not available. Those individuals were counted as selecting the specialties of their first board certifications. All records were double-checked for accuracy, and the records of those individuals whose training patterns were unorthodox were analyzed carefully by the author and his research assistant prior to categorization.

Data for each physician were collected and compiled using a database program, and statistical work was performed using either a mainframe computer or a microcomputer spreadsheet program. The career choices for 1972 and 1973 were combined, as were the career choices for 1982 and 1983, to provide the maximum data for comparison and to discount patterns that could have been unique to a single class of graduating students. Differences between groups were assessed using the chi-square test or Fisher's exact test if values were less than 5 for a study cell.

To assess the relationship between training selected by honors graduates and that selected by all U.S. medical graduates (USMGs), the percentage of study subjects in a specialty was divided by the percentage of USMG housestaff in that discipline (relative weighting) for the year 1974 or 1984. Data for the USMG housestaff distributions in 1974 and 1984 were extrapolated from tables in the annual American Medical Association medical education report and the Directory of Approved Internships and Residencies.[7-10]

Results

Career data were obtained for all 676 graduates. Ninety-three percent of the 1970s sample were men; 71% were men in the 1980s group, a substantial change. The proportions of women in these samples approximated the percentages of women in the graduating classes of the two time periods. The percentage of students in public schools was 40% in both data sets.

Table 1 summarizes the first career choices of the two groups of honors graduates studied. Only internal medicine and neurosurgery suffered statistically significant declines in career selection by graduates ($p < .01$). Family practice and radiology were the only two specialties to have increases, with p values $< .05$, whereas pediatrics and general surgery had large upward trends ($p < .1$). Emergency medicine did not offer formal training in the early 1970s and so comparisons are not meaningful. No one surgical subspecialty had a statistically significant increase in selection, and the differences in collapsed totals for all surgical fields, excluding obstetrics and gynecology, also did not attain statistical significance.

Stratification of the data by sex demonstrated differences in career choices, even though the data for the women in the 1970s are insufficient for most analyses. As shown in Table 1, the men selected training in surgical specialties and radiology significantly more often in the 1980s than did their colleagues a decade earlier. The men and women in the 1980s each chose internal medicine less frequently than did the men in the 1970s ($p < .01$). The 1980s women chose pediatrics ($p < .01$) and obstetrics and gynecology ($p < .05$) much more frequently than did the 1980s men, and these women tended not to enter surgical specialties ($p < .01$). The women in the 1980s chose internal medicine less frequently than did the men (32% versus 38%), but this difference did not reach statistical significance.

Table 2 shows the significant differences, within each time period, between the choices made by the students at the three public schools and the choices made by the students at the six private schools considered in this study. The private school graduates in both time periods tended to prefer internal medicine more than did those honors students in the public universities studied. Private school honors graduates tended not to enter radiology and dermatology in the 1970s, while public university graduates did not pursue psychiatry. Family practice was a career chosen more frequently by public university honors graduates in the 1980s ($p < .01$). No other career choices within the years studied in the two decades differed enough to reach statistical significance.

Table 3 shows the significant differences, across the two time periods, between the choices made by the students within each type of school. Graduates of both public and private universities lessened their selection of internal medicine in the 1980s ($p < .05$). Private school graduates reduced their preference for neurosurgery ($p < .01$) and increased their interest in radiology training ($p < .01$). Family practice gained significant popularity only in the public university setting.

The final data analysis examined the career choices of the honor student cohort in relationship to career selections of all USMGs in that era. (See Table 4.) A discipline was categorized as overweighted when the proportion of honors graduates selecting the field divided by the proportion of USMG housestaff in that field for approximately the same time period (either 1974 or 1984) was greater than 1.3. Those fields with proportions under 0.70 were considered underweighted.

Most fields increased their relative weightings from the 1970s to the 1980s. Neurology, urology, radiology, otolaryngology, and ophthalmology made sizable relative gains. The dramatic gain in relative weighting for neurology reflects its very strong underweighting in the previous decade. The gains made by surgical programs did not result in overweighting of honors students in those fields, but

Table 1

Numbers and Percentages of 676 U.S. Medical School Graduates Who Made Each Career Choice in the Early 1970s and 1980s, with Various Statistical Comparisons*

	1972 and 1973 Graduates						1982 and 1983 Graduates					
	All Graduates		Men		All Women		Graduates		Men		Women	
Career	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
General surgery	21	7	19	7¶	2	10	42	11§	35	13	7	6**
Cardiovascular	3	1	3	1	0	0	4	1	4	1.5	0	0
Neurosurgery	11	4	11	4	0	0	2	.5†	2	.7	0	0
Ophthalmology	7	2.5	7	2.5	0	0	14	4	11	4	3	2.7
Orthopedics	7	2.5	7	2.5	0	0	13	3	13	5	0	0¶
Otolaryngology	2	1.5	2	.7	0	(0)	5	1	3	(1)	2	(2)
Plastic surgery	4	1.5	4	1.5	0	0	2	.5	2	.7	0	0
Urology	2	.5	2	.7	0	0	7	2	5	2	2	2
Total surgery	57	19	55	20¶	2	10	89	23	75	28	14	12.5‖
Internal medicine	149	51	138	50.5‖	11	55	141	37†	105	39	36	32
Pediatrics	25	8.5	21	7.5	4	20	48	12.5§	25	9	23	20.5‖
Family practice	4	1	4	1.5	0	0	15	4‡	9	3	6	5
Obstetrics-gynecology	12	4	12	4.5	0	0	20	5	10	4	10	9¶
Anesthesiology	2	.5	2	.7	0	0	6	1.5	6	2	0	0
Dermatology	3	1	3	1	0	0	4	1	1	.5	3	2.7**
Emergency medicine	0	0	0	0	0	0	4	1	2	.7	2	2
Neurology	1	.5	1	.5	0	0	6	1.5	4	1.5	2	2
Pathology	14	5	14	5	0	0	11	3	8	3	3	2.7
Psychiatry	13	4.5	12	4.5	1	5	15	4	8	3	7	6
Radiology	7	2.5	5	2‖	2	10	22	6‡	17	6	5	4.5
Miscellaneous	6	2	6	2	0	0	2	.5	1	.5	1	1
Total, all specialties	293	100	273	100	20	100	383	100	271	100	112	100

*These honors graduates were from nine high-ranking U.S. medical schools, 293 in the classes of 1972 and 1973 and 383 in the classes of 1982 and 1983. Honors graduates were defined as graduating with honors or as members of the Alpha Omega Alpha honor society. See the Method section for the list of schools.

†$p < .01$ in comparing the 1970s and 1980s graduates.

‡$p < .05$ in comparing the 1970s and 1980s graduates.

§$p < .1$ in comparing the 1970s and 1980s graduates.

‖$p < .01$ in comparing the 1970s men and 1980s women with the 1980s men.

¶$p < .05$ in comparing the 1970s men and 1980s women with the 1980s men.

**$p < .1$ in comparing the 1970s men and 1980s women with the 1980s men.

Table 2

Significant Differences, within Each of Two Time Periods, between the Career Choices of Honors Graduates from Six Private and Three Public Medical Schools

	1972 and 1973 Graduates				1982 and 1983 Graduates			
	Private		Public		Private		Public	
Career Choice	No. Choosing	% Choosing	No. Choosing	% Choosing	No. Choosing	% Choosing	No. Choosing	% Choosing
Internal medicine	98	56	51	44‡	93	41	48	31§
Family practice	2	1	2	2	4	2	11	7†
Psychiatry	11	6	2	2‡	11	5	4	3
Radiology	1	0.5	6	5‡	12	5	10	6.5
Dermatology	0	0	3	2.5§	3	1	1	0.5

*These honors graduates were from nine high-ranking U.S. medical schools, 293 in the classes of 1972 and 1973 and 383 in the classes of 1982 and 1983. Honors graduates were defined as graduating with honors or as members of the Alpha Omega Alpha honor society. See the Method section for the list of schools.

†$p < .01$; ‡$p < .05$; §$p < .1$.

Table 3

Significant Differences, across Two Time Periods, between the Career Choices of Honors Graduates within Each of Two Types of School*

	Private				Public			
	1972 and 1973 Graduates		1982 and 1983 Graduates		1972 and 1973 Graduates		1982 and 1983 Graduates	
Career Choice	No. Choosing	% Choosing	No. Choosing	% Choosing	No. Choosing	% Choosing	No. Choosing	% Choosing
Internal medicine	98	56	93	41†	51	44	48	31‡
Family practice	2	1	4	2	2	2	11	7‡
Neurosurgery	8	4.5	1	0.5†	3	2.5	0	0.5
Plastic surgery	1	0.5	2	1	3	2.5	0	0§
Radiology	1	0.5	12	5†	6	5	10	6.5

*These honors graduates were from nine high-ranking U.S. medical schools, 293 in the classes of 1972 and 1973 and 383 in the classes of 1982 and 1983. Honors graduates were defined as graduating with honors or as members of the Alpha Omega Alpha honor society. See the Method section for the list of schools.

†$p < .01$; ‡$p < .05$; §$p < .1$.

rather represented increases that brought honors student selection of those fields in line with the selections of their classmates. This trend can best be seen by collapsed values for surgery, which indicate a modest increase in relative weighting from .70 in the 1970s to 1.03 in the 1980s. Indeed, no surgical field was overweighted in the 1980s. Moreover, neurosurgery and plastic surgery suffered relative reductions in popularity and became underweighted.

Family practice and anesthesiology remained underweighted, while most disciplines underweighted in the 1970s group increased their graduate shares to a neutral level. Radiology was the only field to go from an underweighted to an overweighted status.

Only a few specialties suffered declines in their relative weightings: internal medicine, neurosurgery, plastic surgery, and pathology. Despite its relative decline, internal medicine remained one of the most overweighted disciplines selected by honors students, but far less so than in the 1970s. Neurosurgery suffered the largest relative decline in popularity from its greatly overweighted status in the 1970s.

Discussion

During the 1970s, medical manpower was subject to several forces simultaneously: expansion in medical school

Table 4

A Comparison of the Career Choices Made by 676 U.S. Medical School Graduates in the Early 1970s and 1980s with the Career Choices of All U.S. Medical School Graduates in Approximately the Same Two Time Periods*

Weighting Category†	1972 and 1973 Career	1972 and 1973 Weighting	1982 and 1983 Career	1982 and 1983 Weighting
Overweighted	Neurosurgery	3.66	Pediatrics	1.44
	Internal medicine	2.0	Internal medicine	1.31
	Pathology	1.45	Radiology	1.31
Neutral	Cardiovascular surgery	1.24	Cardiovascular surgery	1.28
	Plastic surgery	1.01	Ophthalmology	1.28
	Pediatrics	.91	Urology	1.15
	Obstetrics-gynecology	.73	Pathology	1.09
			Obstetrics-gynecology	.87
			Orthopaedics	.89
			Neurology	.89
			Psychiatry	.83
			Otolaryngology	.81
			General surgery	.77
			Dermatology	.70
Underweighted	General surgery	.67	Neurosurgery	.66
	Ophthalmology	.59	Plastic surgery	.55
	Dermatology	.57	Emergency medicine	.37
	Psychiatry	.56	Family practice	.31
	Orthopedics	.47	Anesthesiology	.22
	Radiology	.43		
	Otolaryngology	.32		
	Urology	.27		
	Anesthesiology	.25		
	Family practice	.19		
	Neurology	.16		

*These honors graduates were from nine high-ranking U.S. medical schools, 293 in the classes of 1972 and 1973 and 383 in the classes of 1982 and 1983. Honors graduates were defined as graduating with honors or as members of the Alpha Omega Alpha honor society. See the Method section for the list of schools.

†Career choices were categorized as overweighted if the proportion of honors graduates selecting the discipline divided by the proportion of U.S. medical school graduates housestaff selecting that field during approximately the same time period (1974 or 1984) was greater than 1.3. Those fields with a proportion under 0.70 were considered underweighted.

enrollments, increased percentages of women in training, alterations in the relative payments to different specialties, a rising debt burden of medical trainees, and the growth of medical technology, to name just a few. Changes in training selection can be obscured by alterations in the percentages of foreign medical graduates, barriers to entering a specialty, and lack of enough time to discern patterns of change. This study examined the career choices of the honors students at the most prestigious medical schools as the most likely way to learn the directions in training of the best students in the medical education system.

The data obtained in this study indicate that honors graduates in the early 1980s chose careers in a more diffuse and balanced manner than did their counterparts in the 1970s and that this pattern of choices was much like the pattern of choices made by all U.S. medical school graduates during those years. While internal medicine has suffered a statistically significant decline in career selection since the 1970s, it remained overweighted in the 1980s, thus demonstrating its overwhelming predominance as a career choice in the 1970s. The migration of applicants away from internal medicine occurred in two major patterns: a movement of men into surgical specialties and the preferences of women for careers in pediatrics and obstetrics-gynecology. Pediatrics faces many of the same economic and training problems as internal medicine, but increased its share of honors graduates, particularly among women, and slightly among men as well. Radiology had a statistically significant increase in career choices, but this growth was tempered by sizeable increases only among men and private school graduates among the students selected for this study.

Because of the small number of women honors graduates in the 1970s cohort, direct comparisons of specialty choices were not meaningful for most fields. Internal medicine, however, had sufficient numbers to demonstrate a statistically significant decline in career interest in this field by women honors graduates ($p < .01$). In fact, this decline was greater than that seen for the men. Women entered pediatrics and obstetrics-gynecology at a rate nearly double that of men.

In the literature, analysis of residency training differences by sex for all graduates in 1982[8,10,11] shows that while women made up only 23% of the housestaff population in 1982, they accounted for 50% of pediatrics residency positions. Sixteen percent of all women went into pediatrics in 1982, which is slightly below the 20% seen in the honors cohort for that year. Similarly, only 8% of all women went into surgical fields, as opposed to the 12.5% seen in the honors cohort. From this and other data, it is clear that there are differences in medical career preferences between men and women and these differences may be due to training environment, specialty content, and perhaps practice style. As the number of women in medicine expands, more attention may need to be paid to these differences.

Family practice appealed to few honors graduates in the 1970s; this fact may reflect the early development of this specialty. Nevertheless, despite statistically sizeable increases, the 1980s honors cohort chose family practice far less often than did their classmates, and the relative increase in honors students entering family practice occurred almost entirely at public university medical schools. This trend probably reflects the lack of development of family practice at many private medical schools and the legislative requirements and support for such training at public institutions.

Anesthesiology attracted relatively few honors graduates compared with USMG residents, but the data in this study underestimate the eventual distribution of honors graduates. Many individuals switch into anesthesiology after starting surgery or internal medicine residencies, and this switching would not be found by the methodology of this study.

The trends for students' choices in the early 1980s may have changed by now (1989). But because this study examined confirmed residency data, only in the upcoming years will a follow-up study be possible. Use of data from the residency matching program would miss some specialty selection, because many graduates would be in preliminary programs in medicine and surgery and therefore could be incorrectly categorized.

Although this study reviewed the recorded training experience of honors graduates, it examined their first-intention career choices only, and not their final career paths. This approach, however, provides more accurate results than recording the data from the residency match, because that approach would overemphasize transitional training choices at the expense of later subspecialty career choices. Therefore, these data contain a few distortions resulting from migration patterns of physicians in training. For example, the number of trainees in general surgery is falsely elevated because several individuals opted for radiology, anesthesia, or pathology after one or two years of surgical residency. Similarly, internal medicine lost graduates to radiology, anesthesiology, and dermatology, but these graduates were categorized as internists because of their continuation into a second year of residency in that field.

Recent data from the Association of American Medical Colleges indicate that most students pursue careers that they had originally desired.[12] There may be barriers to entry in some of the most limited specialty fields, but the author has assumed this factor should not come into play with the group of students in this study.

Some of the comparisons may not have reached statistical significance because of the small number of graduates in this study, but general trends are discernible from the data. Similarly, because of fairly small numbers of trainees in some specialty fields, the relative weighting figures should be taken as estimates and not precise measurements.

In conclusion, career choices among honors graduates from pres-

tigious medical schools have changed over the last two decades. The general trend is away from internal medicine, which attracted a predominance of these graduates in the 1970s, resulting in a relative underweighting of other specialties, particularly those in surgery. Pediatrics, which faces many of the same training and practice problems as internal medicine, increased its share of honors graduates, particularly among women. The figures from the 1980s indicate a more balanced pattern of career selection, with no one field attracting honors graduates out of proportion to its trainee population.

The author thanks M. Roy Schwarz, M.D., and Frank Riddick, M.D., for their thoughtful reviews and comments of a draft of this paper. Norbert Budde, Ph.D., was helpful in working with the American Medical Association Masterfile. Mark Anderson provided data processing and Phyllis Milne prepared the text.

References

1. McCarty, D. J. Why Are Today's Medical Students Choosing High-Technology Specialties over Internal Medicine? *N. Engl. J. Med.* **317**(1987):567–569.
2. Scherr, L. Graduate Medical Education: A Vital Renewal for Internal Medicine. *Ann. Intern. Med.* **107**(1987):769–771.
3. Tudor, C. G. DataWatch: Medical Students' Specialty Choices: The Case of Internal Medicine. *Health Aff.* **7**(1988): 37–41.
4. Gourman, J. *The Gourman Report: A Rating of Graduate and Professional Programs in America and International Universities.* 2d ed. Los Angeles, California: National Education Standards 1982, p. 88.
5. Cole, J. R., and Lipton, J. A. The Reputations of American Medical Schools. *Social Forces* **55**(1977):662–684.
6. *Directory of Medical Specialists* 2d ed., vol. 1-3. Chicago, Illinois: A. N. Marquis Company, 1985–1986.
7. Graduate Medical Education: 76th Annual Report on Medical Education in the United States 1975–1976. *JAMA* **236**(1976): 2971–2992.
8. Crowley, A. E. Graduate Medical Education in the United States. *JAMA* **254**(1985):1585–1593.
9. *Directory of Approved Internships and Residencies.* Chicago, Illinois: American Medical Association, 1984.
10. *Directory of Approved Internships and Residencies.* Chicago, Illinois: American Medical Association, 1974.
11. Crowley, A. E., Etzel, S. I., and Petersen, E. S. Undergraduate Medical Education. *JAMA* **258**(1987):1013–1020.
12. Dial, T. H., and Lindley, D. W. Predictive Validity of Specialty Choice Data from AAMC Graduation Questionnaire. *J. Med. Educ.* **62**(1987):955–958.

AAMC DATA REPORT

Present Activities of 1989 U.S. Medical Graduates

Yearly since 1983 the Association of American Medical Colleges (AAMC) and the National Resident Matching Program (NRMP) have tracked all U.S. graduates and all residents who were in programs accredited by the Accreditation Council for Graduate Medical Education (ACGME). The results of this tracking for the 1989 U.S. medical school graduates are presented in the two tables of this data report. The AAMC defines graduation year on an academic calendar basis of July 1 through June 30. Most of the 1988–89 graduates are entering first-year residencies; however, two adjustments have been made to align the data with the NRMP cycle. First, the 75 late summer graduates have been omitted from the tables, because these graduates obtained residencies in the previous year and are thus generally in a second-year residency. Second, the 66 who graduated after July 1, 1989, but nevertheless were able to obtain a residency for 1989–90 are included.

Table 1 presents the numbers and percentages of all the

Table 1

Numbers and Percentages of All 1989 U.S. Medical School Graduates Who Obtained Residencies (Either through or outside the National Resident Matching Program) and Who Did Not Obtain Residencies, by Ethnic-Racial Background and Gender

	Through NRMP		Outside NRMP		Total		Did Not Obtain Residency		Total, All Graduates	
Ethnic-Racial Background and Gender	No.	%	No.	%	No.	%	No.	%	No.	%
All graduates										
Underrepresented minorities										
Black	632	78.2	155	19.2	787	97.4	21	2.6	808	100.0
Indian	49	86.0	8	14.0	57	100.0	0	—	57	100.0
Mainland Puerto Rican	92	78.0	23	19.5	115	97.5	3	2.5	118	100.0
Mexican American	196	80.0	41	16.7	237	96.7	8	3.3	245	100.0
White	10,611	85.3	1,624	13.1	12,235	98.3	208	1.7	12,443	100.0
Commonwealth Puerto Rican	77	32.2	159	66.5	236	98.7	3	1.3	239	100.0
Other Hispanic	227	87.6	29	11.2	256	98.8	3	1.2	259	100.0
Asian	1,049	86.0	149	12.2	1,198	98.2	22	1.8	1,220	100.0
Unknown ethnic-racial background	202	87.1	25	10.8	227	97.8	5	2.2	232	100.0
Total, all graduates	13,135	84.1	2,213	14.2	15,348	98.3	273	1.7	15,621	100.0
Men										
Underrepresented minorities										
Black	289	75.3	92	24.0	381	99.2	3	.8	384	100.0
Indian	27	84.4	5	15.6	32	100.0	0	—	32	100.0
Mainland Puerto Rican	56	75.7	17	23.0	73	98.6	1	1.4	74	100.0
Mexican American	128	79.0	29	17.9	157	96.9	5	3.1	162	100.0
White	7,094	83.7	1,253	14.8	8,347	98.5	125	1.5	8,472	100.0

Table 1

Numbers and Percentages of All 1989 U.S. Medical School Graduates Who Obtained Residencies (Either through or outside the National Resident Matching Program) and Who Did Not Obtain Residencies, by Ethnic-Racial Background and Gender (*Continued*)

Ethnic-Racial Background and Gender	Through NRMP		Outside NRMP		Total		Did Not Obtain Residency		Total, All Graduates	
	No.	%	No.	%	No.	%	No.	%	No.	%
Commonwealth Puerto Rican	52	34.2	99	65.1	151	99.3	1	.7	152	100.0
Other Hispanic	153	86.0	23	12.9	176	98.9	2	1.1	178	100.0
Asian	666	84.2	111	14.0	777	98.2	14	1.8	791	100.0
Unknown ethnic-racial background	137	86.2	18	11.3	155	97.5	4	2.5	159	100.0
Total, all graduates	8,602	82.7	1,647	15.8	10,249	98.5	155	1.5	10,404	100.0
Women										
Underrepresented minorities										
Black	343	80.9	63	14.9	406	95.8	18	4.2	424	100.0
Indian	22	88.0	3	12.0	25	100.0	0	—	25	100.0
Mainland Puerto Rican	36	81.8	6	13.6	42	95.5	2	4.5	44	100.0
Mexican American	68	81.9	12	14.5	80	96.4	3	3.6	83	100.0
White	3,517	88.6	371	9.3	3,888	97.9	83	2.1	3,971	100.0
Commonwealth Puerto Rican	25	28.7	60	69.0	85	97.7	2	2.3	87	100.0
Other Hispanic	74	91.4	6	7.4	80	98.8	1	1.2	81	100.0
Asian	383	89.3	38	8.9	421	98.1	8	1.9	429	100.0
Unknown ethnic-racial background	65	89.0	7	9.6	72	98.6	1	1.4	73	100.0
Total, all graduates	4,533	86.9	566	10.8	5,099	97.7	118	2.3	5,217	100.0

1989 graduates who obtained their residencies through the match, who obtained their residencies by means other than the match, and who did not obtain residencies. The data are presented in terms of the residents' ethnic-racial backgrounds and genders. Those who did not obtain residencies include physicians involved in such activities as finishing Ph.D. work, pursuing research, traveling, and simply taking a year off, as well as an unknown number who were unable to obtain a position. Very few of these physicians are expected to be practicing, even though three states consider them eligible for licensure: Louisiana, Ohio, and Tennessee. Overall, these data are similar to those of past years. Black, Puerto Rican, and Mexican American graduates were more likely than were other graduates to obtain their residencies outside the match. Commonwealth Puerto Ricans showed very low match rates because few Puerto Rican hospitals participate in the NRMP. A higher percentage of black women (4.5%) were without residencies than was true for the graduates in any other category (not counting the categories with very small numbers of graduates). In fact, a slightly higher proportion of all women than of men are not in a residency.

Table 2 shows the total number of graduates and the number by gender enrolled in each type of residency program, both those graduates who obtained their positions through the match and those who obtained their positions by other means. The table also lists the activities of those graduates who did not obtain residencies. The residency programs of the military and of mainland Puerto Rico are listed separately as types of residencies rather than being intermixed among the appropriate specialties because few of these programs participate in the match. Overall, 85.6% of all 1989 U.S. medical school graduates obtained their residencies through the match. Several specialties obtained all of their U.S. graduates through the match. Psychiatry obtained 95%;

Table 2

Numbers and Percentages of All 1989 U.S. Medical School Graduates Who Obtained Residencies (Either through or outside the National Resident Matching Program) and Who Did Not Obtain Residencies, by Graduates' Present Activity (Residency Specialty or Other Activity)

Present Activity	Obtained Residency through NRMP				Obtained Residency outside NRMP				
	Men	Women	Total	% of All Graduates	Men	Women	Total	% of All Graduates	Total, All Graduates
Residency									
Anesthesiology	153	45	198	84.6%	28	8	36	15.4%	234
Dermatology	6	3	9	100.0%	0	0	0	0.0%	9
Emergency medicine	214	81	295	93.1%	19	3	22	6.9%	317
Family practice	888	561	1,449	93.2%	68	38	106	6.8%	1,555
Internal medicine—preliminary	838	463	1,301	93.3%	72	21	93	6.7%	1,394
Internal medicine—primary care	133	101	234	97.5%	4	2	6	2.5%	240
Internal medicine and pediatrics	89	47	136	95.1%	5	2	7	4.9%	143
Internal medicine and psychiatry	4	0	4	100.0%	0	0	0	0.0%	4
Internal medicine	2,023	1,007	3,030	92.7%	168	71	239	7.3%	3,269
Neurology	14	8	22	88.0%	3	0	3	12.0%	25
Nuclear medicine	1	0	1	25.0%	3	0	3	75.0%	4
Obstetrics and gynecology	438	443	881	94.5%	27	24	51	5.5%	932
Ophthalmology	13	1	14	73.7%	3	2	5	26.3%	19
Otolaryngology	36	4	40	53.3%	29	6	35	46.7%	75
Pathology	145	107	252	81.3%	32	26	58	18.7%	310
Pediatrics—primary	11	17	28	96.6%	1	0	1	3.4%	29
Pediatrics	483	741	1,224	94.7%	29	39	68	5.3%	1,292
Physical medicine and rehabilitation	55	27	82	94.3%	2	3	5	5.7%	87
Preventive medicine (general)	2	0	2	66.7%	1	0	1	33.3%	3
Psychiatry	416	298	714	94.6%	31	10	41	5.4%	755
Radiology—diagnostic	187	74	261	97.8%	5	1	6	2.2%	267
Radiology—therapeutic	8	1	9	69.2%	3	1	4	30.8%	13
Surgery	787	172	959	79.1%	219	35	254	20.9%	1,213
Surgery—neurologic	21	2	23	51.1%	17	5	22	48.9%	45
Surgery—oral	0	0	0	0.0%	4	0	4	100.0%	4
Surgery—orthopedic	392	22	414	99.0%	4	0	4	1.0%	418
Surgery—plastic	6	0	6	85.7%	1	0	1	14.3%	7
Surgery—preliminary	490	76	566	81.8%	111	15	126	18.2%	692
Transitional	676	228	904	91.0%	58	31	89	9.0%	993
Urology	62	1	63	67.0%	28	3	31	33.0%	94
Military programs (all specialties)	0	0	0	0.0%	579	159	738	100.0%	738
Puerto Rican programs (all specialties)	11	3	14	9.0%	86	56	142	91.0%	156
Subtotal	8,602	4,533	13,135	85.6%	1,640	561	2,201	14.4%	15,336
Other activities									
Research	—	—	—	—	—	—	—	—	117
Unknown	—	—	—	—	—	—	—	—	83
Deceased	—	—	—	—	—	—	—	—	2
Non-medical activity	—	—	—	—	—	—	—	—	16
Year off	—	—	—	—	—	—	—	—	67
Total, all graduates									15,621

internal medicine, over 90%. The proportions of senior students obtaining their positions through the match were at high levels for most specialties.

Specialized reports can be produced by the AAMC for individual medical schools, hospitals, or disciplines.

August G. Swanson, M.D.
Richard R. Randlett
Robert A. Haynes, Ph.D.
Charles D. Killian

Dr. Swanson is executive director of the National Resident Matching Program (NRMP) and Vice President for Graduate Medical Education and International Programs, Association of American Medical Colleges, Washington, D.C. Mr. Randlett is deputy director of the National Resident Matching Program (NRMP) and Assistant Vice President for Student Services, AAMC. Dr. Haynes is research associate in the Section for Operational Studies, AAMC. Mr. Killian is senior research associate and director of the Student and Applicant Information Management System (SAIMS), AAMC.

Errata

On page 238 of the May issue of *Academic Medicine*, an error appeared in Table 2. In the column of the table with the heading "AMA," the first line should read "Office and hospital."

On page 240 of the same issue, the first phrase of the first sentence at the top of the page should have been "The author thanks James Cultice of HRSA."